DOCUMENT RESUME

ED 145 815 IR 005 165

TITLE Computing in the Business Curriculum.
INSTITUTION California State Univ. and Colleges, Los Angeles. Div. of Information Systems.
PUB DATE Oct 74
NOTE 259p.

EDRS PRICE MF-$0.83 HC-$14.05 Plus Postage.
DESCRIPTORS Accounting; *Business Education; Catalogs; *Computer Assisted Instruction; *Computer Programs; *Higher Education; Instructional Materials; Management; Management Education; Management Games; Management Information Systems; Marketing; Simulation; Teaching Methods; Teaching Techniques

ABSTRACT

This catalog is a collection of computer programs which have been designed and used as curricular support in Business Education on the college level. It is intended for use by the business instructor who wishes to initiate the use of the computer as an instructional aid in his courses. Discipline areas covered include: (1) accounting, (2) finance, (3) management information systems, (4) management, (5) marketing, (6) quantitative methods, and (7) simulation models. Individual course descriptions and objectives, computer program descriptions and objectives, and program documentation are provided. (Author/STS)

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COMPUTING IN THE BUSINESS CURRICULUM

THE CALIFORNIA STATE UNIVERSITY AND COLLEGES

DIVISION OF INFORMATION SYSTEMS

OCTOBER 1974

IR 005 165

INTRODUCTION

This catalog is a collection of computer programs that are used as curricula support in the Business discipline. It is designed for the business instructor who wishes to use the computer as an instructional tool for the first time. This catalog may be used by other instructors teaching the same or similar courses. By referencing the course name, an instructor can locate information about relevant computer programs, which faculty is using them, and why they are instructional aids.

The catalog is divided into eight parts. Part I is a directory of those classes for which instructional computer programs exist. Parts II through VII contain course descriptions and objectives, computer program descriptions and objectives, and program documentation availability for each major Business discipline. Part VIII contains descriptions of Simulation Models used in all disciplines.

Instructors interested in programs listed here are urged to contact the faculty member using the program to obtain such information as the amount of computing knowledge required of the students, the amount of class time expended by the students and instructor, as well as information necessary for incorporation into the class syllabus, etc.

Additions can be made to this volume by filling out the questionnaire on the next page and forwarding it to The California State University and Colleges, Division of Information Systems, Instructional Support Group, 5670 Wilshire Boulevard, Los Angeles, California 90036.

ACKNOWLEDGMENTS

We wish to express our appreciation to the Deans of the Schools of Business in The California State University and Colleges system for their help in gathering the information for this catalog. Also, we wish to thank those who answered our questionnaires and made materials available for our use. We are also grateful to Professor Ward D. Testerman of California State Polytechnic University, Pomona, for his help in coordinating this project. We are especially indebted to Roger D. Tilly, James B. Savitz, and James C. Hill, students at California State Polytechnic University, Pomona, for their work in writing and editing this catalog.

This project was made possible by a grant from the 1973-74 Fund for Innovation in the Instructional Process.

INSTRUCTIONS: Please fill out one of these forms for each program used as an instructional computer program. If you are using a series of programs, i.e., BIOMEDS, ITS Canned Programs, list each program name under name of program used above. Include programs out of your local Program Library as well as those you wrote yourself or access from SUDC or the Timesharing Network. PLEASE FILL OUT QUESTIONNAIRE IN FULL.

INSTRUCTOR_____ DEPT._____

DISCIPLINE_____ CAMPUS_____

COURSE NAME_____ COURSE NO._____

WHAT IS YOUR COURSE OBJECTIVE?_____

_____

_____

NAME OF PROGRAM USED_____

Would you permit other departments to use it?_____

BRIEF PROGRAM DESCRIPTION_____

_____

_____

BRIEF PROGRAM OBJECTIVE_____

_____

PROGRAM AUTHOR_____

On Which System Does It Run:
_____Timesharing (Answer Questions 1-5)
_____Local Batch (Answer Questions 1,3,4,)
_____SUDC (Answer Questions 1,3,4,6)
_____Other (Name) _____(Answer Questions 1,3,4)

Questions Referenced Above:

1. It is a Public File? Yes__ No__
2. Program File Name_____
3. Is Documentation Available? Yes__ No__ If yes, please attach.
4. Is Documentation Attached? Yes__ No__ If no, how can it be obtained?_____
   _____
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DIRECTORY

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INTRODUCTION TO PRODUCTION OPERATIONS	MGMT015.00
SEMINAR IN POLICY FOUNDATION AND ECONOMIC ANALYSIS	MGMT016.00
MARKETING	MKT000.01
MARKETING PRINCIPLES	MKT001.00
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PREFACE

This is the Accounting Volume of the catalog. It contains the classes being taught under this discipline that use computer programs as instructional aids.

ACCOUNTING

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Principles of Accounting

Professor	Class	Campus
D. P. Neilson	ACC 2251-2252	Hayward
W. J. Wilson	ACC 201	Long Beach
R. J. Hopewell	ACC 201	Long Beach

Course Description

An introduction to accounting analysis and practice.

Course Objective

To familiarize students with basic accounting procedures, statement preparation, analysis, interpretation and use.

Programs

ICAPS: (D. P. Neilson)

Program Description

A set of accounting problems. Each program contains data validation checks to inform the student of errors in order, form, or content of the data he submits. Another group of exercises is less structured than the first set; these allow the student to experiment with various solutions to a specified problem. A further group of exercises demonstrates how some typical accounting applications operate in commercial computer systems.

Project Objectives

This set of programs is used in conjunction with a workbook. These programs provide a means for significant use of the computational and data processing capacity of modern electronic computers in the teaching of accounting. Several techniques that enable the attainment of that goal are employed in the various exercises, but all exercises embody the general theme that the computer is an aid to students in solving accounting problems.

Documentation located in the "Interactive Computerized Problems Set" by Denis P. Neilson.

ICAP 21: (R. J. Hopewell and W. J. Wilson)

Program Description

This program provides journal entries and a Trial Balance according to data cards that the user submits. Error messages relating to individual parts of entries will be printed within the context of the journal entry outputs as each error occurs.

Program Objective

To introduce the student to credit transactions, the accrual principle, and more comprehensive classification schemes for accounts in the Income Statement and Balance Sheet.

Documentation is located in the "Interactive Computerized Problems Set" by Denis P. Neilson.

ICAP 22: (R. J. Hopewell and W. J. Wilson)

Program Description

This program provides journal entries, adjusted Trial Balance, Income Statement, and Balance Sheet prepared in accordance with data submitted by user.

Program Objective

To introduce the student to credit transactions, the accrual principals, and more comprehensive classification schemes for accounts in the Income Statement and Balance Sheet.

Program Documentation found in the "Interactive Computerized Accounting Problems Set" by Denis P. Neilson.

ICAP 44: (R. J. Hopewell and W. J. Wilson)

Program Description

This program provides the schedules of depreciation charges for each year of life of each asset under any or all of the following methods; Straight Line, Sum of Year's Digits, Constant Percentage of Declining Balance, Double Declining with switch to Straight-line, Production Hours, Units of Output.

Program Objective

Permits the student to compare the effects of alternative depreciation methods on a group of assets over their expected life.

Program Documentation found in "Interactive Computerized Accounting Problems Set" by Denis P. Neilsen.

ICAP 74: (R. J. Hopewell)

Program Description

This program calculates any or all of 31 financial ratios including: Current, Quick, Working Capital, Inventory Turnover, Receivables Turnover, Debt-Equity, Net Return on Stockholders Equity, Rate of Return on Common Stock, etc.

Program Objective

This program enables the student to analyze a company and evaluate its financial position.

Program Documentation is found in the "Interactive Computerized Accounting Problems Set" by Denis P. Neilsen.

ICAP 71: (R. J. Hopewell)

Program Description

This program provides a schedule of reclassified changes in account balances and Statement of Services and Use of Funds derived from that schedule.

Program Objective

This program helps the student analyze the funds flow of the company.

Program Documentation is found in the "Interactive Computerized Accounting Problems Set" by Denis P. Neilsen.

Intermediate Accounting

Professor	Class	Campus
M. Moustafa	Acc 300A, 300B	Long Beach
E. M. Andrews	Acc 300A, 300B	Long Beach

Course Description

Intermediate accounting theory including recording, valuation, and statement presentation of assets, liabilities, capital, earnings, funds statements, financial analysis.

Course Objective

To give the students a broad introduction to all of the aspects of accounting theory.

Programs

ICAP 44 (M. Moustafa and E. M. Andrews)

Program Description

This program provides the schedules of depreciation charges for each year of life of each asset under any or all of the following methods; Straight Line, Sum of Years Digits, Constant Percentage of Declining Balance, Double Declining with switch to Straight-Line, Production Hours, Units of Output.

Program Objective

Permits the student to compare the effects of alternative depreciation methods on a group of assets over their expected life.

Program Documentation located in the "Interactive Computerized Accounting Problems Set" by Denis P. Neilsen.

ICAP 53: (M. Moustafa and E. M. Andrews)

Program Description

This program solves any of a number of problems relating to prices and yields on bond transactions.

Program Objective

Introduces the student to the problems of purchasing and finding yields of bonds.

Program Documentation is located in the "Interactive Computerized Accounting Problems Set" by Denis P. Neilsen.

ICAP 64: (M. Moustafa)

Program Description

This program figures several methods of valuation of inventories for accounting purposes. These methods include Weighted Average Unit Cost, LIFO, FIFO Replacement Cost, Cost or Market, Market Sales Value, Net Realizable Value, Net Realizable Value less Normal Profit, Cost-or-Market (AICPA adjusted).

Program Objective

To introduce the student to the problems of keeping track of inventories.

Program Documentation is located in the "Interactive Computerized Accounting Problems Set" by Denis P. Neilsen.

ICAP 73: (M. Moustafa and E. M. Andrews)

Program Description

This program calculates any or all of 31 financial ratios. These ratios include Quick, Current Net Return on Stockholders Equity, Rate of Return on Common Stock, etc.

Program Objective

This program enables the student to analyze a company and evaluate its financial position.

Documentation found in the "Interactive Computerized Accounting Problems Set" by Denis P. Neilson.

Managerial Accounting

Professor	Course	Campus
R. J. Hopewell	Acc 310	Long Beach
H. A. Hoverland	AD 340	San Bernardino

Course Description

Preparation, use and interpretation of financial statements: evaluation of internal control, systems, and procedures; accounting for and analysis of costs; budget preparation; interpretation of managerial reports.

Course Objective

To instruct students in using accounting information for decision-making purposes and to increase their ability to do so.

Programs

ICAP 74: (R. J. Hopewell)

Program Description

This program calculates any or all of 31 financial ratios including, Current, Quick, Working Capital, Inventory Turnover, Recivables Turnover, Debt-Equity, Net Return on Stockholders Equity, Rate of Return on Common Stock, etc.

Program Objective

To enable the student to analyze a company and evaluate its financial position.

Program Documentation is located in the "Interactive Computerized Accounting Problems Set" by Denis P. Neilsen.

ICAP 71 (R. J. Hopewell)

Program Description

This program provides a schedule of reclassified changes in account balances and a Statement of Source and Use of Funds derived from that schedule.

Program Objective

The output from this program enables the student to follow exactly where funds flow throughout the company.

Program Documentation is located in the "Interactive Computerized Accounting Problems Set" by Denis P. Neilsen.

63 GAME (also known as HOVERLAND)

Program Description

This management game permits five teams or companies to compete in an economic market. Each team has control over a number of decision variables which will determine its success or failure in competing with each other. The basic time period involved for a given set of decisions is the quarter (i.e., three months). The results from one quarter enable each team to make further decisions for the next period. Every fourth quarter, annual statements are produced for each team.

Program Objective

To allow the participants to make managerial decisions in a simulated production and marketing environment.

Documentation information A011.00 can be obtained from Mr. Hoverland at California State College, San Bernardino.

Integrated Data Processing Syscems

Professor	Class	School
M. N. McFee	Acc 704	Fullerton

Course Description

Integrated systems for the collection, processing and transmission of information; aspects of the information services function, feasibility studies, case studies of operating systems.

Course Objective

To instruct the student in the objective design, evaluation and implementation of a programming system.

Programs

/PLOTTR/: (Timesharing)

Program Description

This program plots from one to six functions of one variable simultaneously.

Program Objective

To demonstrate to the student the versatility of the computer.

Documentation found in the ITS manuals.

/STAT/: (Timesharing)

Program Description

A package for many statistical problems (maximum size 10 variables by 150 subjects). Transformation of data may be performed. Separate instructions are available but not necessary for most users. Options include: Mean, Standard Deviation, Standard Error, maximum, minimum, range, correlation matrix, scatter diagram, histogram, multiple line plot, stepwise multiple linear regression, simple linear regression, speciman rank correlation, polynomial regression, Chi-Square, simultaneous equations, frequency tables, observations in given bounds, first four moments, T-tests, multiple linear regression, canonical correlation, Mann-Whitney U, Freedman 2-way ANOVA, Cochran's Q, Kendalls TAU, Discriminate analysis, factor analysis, time series.

Program Objective

A set of programs which helps the student understand the various uses of the computer in business application.

Documentation located in the ITS manuals.

/SDEP/: (Timesharing)

Program Description

This program calculates depreciation by any of four methods.

Program Objective

This program allows the student to compare the depreciation charges calculated in four different manners.

Documentation located in ITS manuals.

/LEASE/: (Timesharing)

Program Description

This program assists the user in determining whether to purchase or lease an asset.

Program Objective

To aid the student in analyzing investment options.

Documentation located in ITS manuals.

/FETCH/: (Timesharing)

Program Description

A general purpose information storage and retrieval subsystem that enables the user to establish a large data file that he can easily manipulate.

Program Objective

To introduce the student to large file structures. How to build files and how to access them.

Program Documentation is located in ITS manuals.

DOCUMENTATION

GENERAL DESCRIPTION 63 GAME

System/360 Management Game permits five (5) teams or companies to compete in an economic market. Each team has control over a number of decision variables which will determine its success or failure in competing with each other.

The basic time period involved for a given set of decisions is the quarter (i.e., three months). The results from one quarter enable each team to make further decisions for the next period. Every fourth quarter, annual statements are produced for each team.

The Game Supervisor has control over three parameters which may be varied from quarter to quarter and from company to company. These are described below.

INPUT DESCRIPTION

The Game Supervisor must supply four (4) data cards (CTL card, Z Data card, Alpha Data card, and Alpha-Prime Data card). Each team must supply one data card (Decision Data Card).

CTL DATA CARD

Card Column	Parameter
6 - 7	Quarter - This variable is equal to the quarter which is being played. Permissible values are 0 - 99. A value of "0" indicates quarter Zero which will produce initial reports for each company.
14	Short Code - Indicates what action should be taken if a negative surplus is encountered. Acceptable values and their meanings are listed in APPENDIX - A
21	Annual Statement Control - This variable normally has a value of "0" or blank indicating annual statements are to be produced every fourth quarter (0,4, 8,12...). A value of one will force statements to be produced for this quarter based on the previous four quarters.
28	Copies, Reports - This variable specifies the number of each company's quarterly report (and annual report at the end of each year) to be printed. (Maximum is 20).

Card Column	Parameter
35	Copies, Worksheets - This variable specifies the number of copies of each team's decision worksheets to be printed. Maximum is 20.

N.B. All above data must be right-justified and punched without decimal point, etc.

Z DATA CARD

Card Column	Parameter
1 - 7	Z

This parameter indicates the general state of the economy. Possible values range between +200,000 to -200,000 in steps of 1.

A value of approximately 50,000 has proven to provide a realistic rising economy, and is, therefore, recommended.

ALPHA Data Card

The value of Alpha indicates the company's effectiveness in research and development. Five Alpha values are to be given; one for each company. Possible values range between 10 and 50 in steps of "1". The effect Alpha will have on a company is determined by the difference in its value as compared to another company's value (i.e., the ratio of the two values not their actual values).

Company	Card Column	
1	6 - 7	
2	13 - 14	
3	20 - 21	Card Locations for Company Alpha Values
4	27 - 28	
5	34 - 35	

ALPHA-PRIME DATA CARD

Alpha Prime indicates the company's effectiveness in marketing. Five values must be given, one for each company. Values may range between 10 and 50 in steps of 1. All five values are given on one card having the same format as the Alpha Data Card. The effect of Alpha-Prime is measured like that of Alpha (i.e., the ration between companies.).

DECISION DATA CARD (These cards will be punched by each team and given to the Game Supervisor)

There must be one card of this type for each company. Values for the various parameters listed are chosen by each team from the "Operating Decision Information" portion of the quarterly report.

Card Column	Variable
1 - 7	Additional Plant Investment
8 - 14	Discard of Plant
15 - 21	Market Research Cost
22 - 28	Price Multiplies by 100
29 - 35	Unit Cost multiplied by 1000
36 - 42	Number of Units
43 - 49	Cost of Production
50 - 56	Marketing
57 - 63	Research and Development
64 - 70	Dividends
71 - 77	Change in Loans, Positive or Negative
78 - 80	Company Number (1 - 5)

NOTE: ALL DATA MUST BE RIGHT JUSTIFIED AND MUST NOT CONTAIN A DECIMAL POINT.

INPUT SEQUENCE OF DATA CARDS

The program must be supplied with the following Data Cards for each quarter:

Z Data Card

Alpha Data Card

Alpha-Prime Data Card

Decision Data Card for companies one through five

These cards must be in this sequence and the decision data cards must be in ascending sequence by company number

Since the program does not store results from one quarter to another, the Game Supervisor must supply it with a CTL Card

indicating what quarter is being played. Along with the Data Cards for this quarter (see above), the Data Cards for this quarter must be preceded by a similar set of Data Cards for each previous quarter including quarter Zero.

EXAMPLE: Quarter 2

	Card Type	# of Cards	
QRTO	CTL Card	1	
	A, Alpha, Alpha Prime	3	
	QRTO Decisions	5	
QRTL	Z, Alpha, Alpha Prime	3	First Team Decision
	QRTL Decisions	5	
QRT2	Z, Alpha, Alpha Prime	3	Second Team Decision
	QRT2 Decisions	5	

JOB SET-UP AND OPERATING PROCEDURES

Five or more copies of quarter "0" reports will be run off, using the quarter "0" sample control cards, to distribute among the various teams and monitoring personnel. These reports should be identical (i.e., each of the teams should have the same Alpha, Alpha Prime and Decision Data Cards).

Each team makes its decisions for Quarter 1 and submits one data card to the Game Supervisor. A complete run for the first Quarter is then made. This should be submitted as a normal batch job as shown in Appendix B. The resulting output is distributed to the teams and monitoring personnel by the Game Supervisor.

Each team then makes decisions for Quarter 2 and punches new data cards. This process continues for as many quarters as are considered useful. At each Quarter the Game Supervisor provides a new Z card, Alpha Card, and Alpha-Prime Card.

A sample data stack for two quarters is shown in Appendix B. It is important to understand that the data for all previous quarters remain in the stack when the cards for a new quarter are added.

A P P E N D I X " A "

This variable indicates what action should be taken if a Negative Surplus is encountered.

Value	Action
1	Ignore shortage and read a new decision data card for this company.
2	Accept loans up to line of credit.
3	Accept all available loans.
4	Terminate execution upon shortage.
5	Ignore shortage and continue processing.

NOTE: A value of 3 is recommended.

Also, it should be noted that the Short Code Parameter values should not be changed from quarter to quarter as this value has a bearing on the intermediate calculations for each quarter preceding the quarter presently being run.

PREFACE

This is the Finance Volume of the catalog. It contains the classes being taught under this discipline that use computer programs as instructional aids.

FINANCE

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COMPUSTAT QUARTERLY FINANCIAL ANALYSIS PROGRAM	F022.00

Business Finance

Professor	Class	Campus
G.L. Marrah	BA 133	Sacramento
J.M. Stockdale	BA 133	Sacramento
T. McCaughey	BA 102	Humboldt

Course Description

Studies the characteristics and uses of stocks and bonds; financial aspects of their promotion; securities markets and their regulations; sources and uses of short-term funds; management of earnings; expansion, failure and reorganization.

Course Objective

To show the students some of the problems and some of the solutions to the problems of financing an organization.

Programs

PROFORMA: G.L. Marrah

Program Description;

This program will project proforma statements and ratio analysis of a firm. Up to five periods may be forecasted.

Program Objective;

To aid the student in analyzing the financial position of a firm and to help him give recommendations on how to help the firm.

Documentation information can be obtained from Mr. Marrah at California State University, Sacramento. F011.00

FINANSIM: (T. McCaughey)

Program Description;

Each FINANSIM firm produces and sells an unnamed, unidentified product. For each period of play, which represents one year, FINANSIM managers make a number of decisions: to determine the number of production units to be manufactured; to purchase or sell marketable securities; to float new or retire existing

20-year debentures; to obtain bank-term loans to help finance company operational to issue new common stock; to make dividend payments on existing common stock; to maintain or expand the firms plant and machine capacity; and to invest in any or all of three different types of capital improvements each period will effect future savings for the firm by reducing its operating costs.

Program Objective:

To familiarize the student with the problems of financial decisions in a simulation of a business environment.

Documentation is located in "Computer Models in Operations Management A Computer - Augmented System," by Roy D. Harris and Michael J. Maggard. Harper and Row, 1972.

STATPAK: (J.M. Stockdale)

Program Description:

A set of statistical reoutines for use by those needing statistical analysis. This program contains the following routines: Analysis of Variance (VARI), Cononical Correlation (CANC), CHI-Square (CHS), Correlation Analysis (SIM), Correlation Matrix (CRMK), Cross Tablulation (XTAB), Data Screening (SCRM), Discriminant Anlysis (DISC), Factor Analysis (FACTO), Frequency Distribution (FREQ), Fredman Two-Way Analysis of Variance (FTWA), Koomgrov-Smirnov's Two Sample Limiting Distribution (KOLZ), Kruskol-Wallis One-Way of Variance (KVAR), Mann-Whintey Utest (UTEST), Multiple Linear Regression (MULT), Polynominal Regression (POLY), Simultaneous Equations (SIMO), Spearman-Rank Correlation (SRNK), Stepwise Multiple Regression (STEP), Tally (TALY), T-Test (TTST).

Program Objective:

To show students the use of statistical routines in figuring out uses of stocks, bonds, and security markets.

Documentation is located in the Sacramento STATPAK manuals.

Financial Management

Professor	Class	Campus
G. L. Marrah	BA 134	Sacramento
D.O. Calkins	BA 234	Sacramento
R. Fletcher	BPA 381	Bakersfield
R. Fletcher	BPA 686	Bakersfield
T.L. Heflin	BPA 381	Bakersfield

Course Description

Formulation of financial policies for obtaining and using financial resources. Emphasis is placed on the theoretical and practical problems in planning and controlling a company's financial structure, capital investments, working capital, long-term financing, mergers and reorganizations.

Course Objective

To provide the student with insight into the types of decisions financial managers make and implement.

Programs

FINANALS: (G.L. Marrah)

Program Description;

This program reads the figures, turnover ratios, and percentages critical to the base period. Then generates an Income Statement, Statement of Retained Earnings, Balance Sheet and Ratio Analysis. The program projects Pro-forma statement and ratio analysis up to 12 periods.

Program Objective;

To aid the students in making financial decisions and analyzing the financial position of the firm.

F012.00

Documentation information can be obtained from Mr. Marrah at California State University, Sacramento.

MARKOWITZ PORTFOLIO: (D.O. Calkins)

Program Description:

This program provides a series of efficient portfolios beginning with the slope of the return, variances (E, V),

curve at approximately zero and continuing until that slope has increased to infinity. If necessary, the program will compute "lending" or "borrowing" portfolios based upon the lending and borrowing rates provided by the user.

Program Objective:

To provide the student an insight into the financial organization of corporations and the financial problems encountered in these corporations.

F013.00

Documentation information can be obtained from Mr. Calkins at California State University, Sacramento.

SHARPE PORTFOLIO: (D.O. Calkins)

Program Description:

This program uses the Sharpe diagonal model for portfolio selection. It determines the composition of a number of portfolios in the "efficient set" beginning with the slope of the return, variance (E, V) curve at zero and continuing until that slope has been increased to infinity.

Program Objective:

To give the student an insight into the problems of choosing and obtaining securities.

F013.00

Documentation information can be obtained from Mr. Calkins at California State University, Sacramento.

PUFFER: (R. Fletcher)

Program Description:

Performs simple and multiple correlation and regressions and executes tests of significance on the results. Output includes the constant and regression coefficients, T-values for the constant and regression coefficients, R-square, R, F-value, Durban-Watson statistic, Standard error of the estimate and residuals. Program will handle up to 60 variables with a maximum of 150 periods or observations for each variable.

Program Objective:

To help the student through the use of correlation and regression analysis choose the best alternative out of the many alternatives he may have.

Documentation is located at California State University, Northridge Computer Center.

LP/70: (R. Fletcher)

Program Description:

This program sets up and solves linear programming problems using "Contracted Tableau" from a simplex method. Print out can include data card images, data control printout, input data in Tableau Form, each interaction in Tableau Form, trace of the solution procedure, Final Tableau, final report including values of decision variables and slack variables in the solution. Program can handle up to 95 variables and 95 constraints.

Program Objective:

To show the student another way of analyzing his data so he can come up with the best possible decision.

Documentation is located at California State University, Northrdige Computer Center

Security Investments

Professor	Class	Campus
J. R. Nichols	FIN 335	Fullerton

Course Description

Principals underlying the analysis, selection and management of securities; computerized statement and portfolio selection methods.

Course Objective

To enable the student to have insight and to make better security investment decisions.

Programs

NICHOLS I:

Program Description;

A financial analysis package which adjusts historical per share data to the current basis, provides selected ratios and developes a number of forecasts using a non-linear growth model.

Program Objective;

Enables the student to analyze a company's annual statement with the computer and to make recommendations using the output information.

F014.00

Documentation information can be obtained from Mr. Nichols at California State University, Fullerton.

NICHOLS II:

Program Description:

A forecasting model which allows the analyst to specify an exogenous variable, extend this series five years into the future and then examine the relationship between the exogenous variable and a number of endogenous selections. This relationship is also extended five years. Additional output of the program are the relative parameters between the variables (intercept and coefficient).

F006.00

Program Objective:

Enables the student to project a decision five years into the future to forecast what will happen.

F015.00

Documentation information can be obtained from Mr. Nichols at California State University, Fullerton.

BABCOCK MODEL:

Program Description

The Babcock Model prints financial data in much the same manner as the Nichols I program dn then adds another dimension to security analysis. The program determines a number of earning ratios for additional growth analysis.

Program Objective:

To give the student additional information so he can better know the financial position of the company and make better security investment decisions.

F016.00

Documentation information can be obtained from Mr. Nichols at California State University, Fullerton.

EARNREL MODEL:

Program Description:

A relative valuation model using a three year base moving average to filter securities price movements on the hypothesis that low price earning stocks will on the average result in improved price appreciation and dividend income.

Program Objective:

To aid the student in forecasting stock price changes.

Documentation is located in the "Financial Analyst Journal" Nov-Dec, 1969 by Alex Gould and Maurice Bachbaum entitled: "A Filter Approach Using Earning Relatives."

Security Analysis and Portfolio Management

Professor	Class	Campus
J. R. Nichols	FIN 435	Fullerton

Course Description

Advanced securities analysis course utilizing computer applications for statement analysis, valuation models and portfolio selections and management models.

Course Objective

To give the student actual practice in security analysis in a simulated business atmosphere.

Programs

COMPUSTAT ANNUAL FINANCIAL ANALYSIS PROGRAM

Program Description;

A financial analysis program in millions compiling adjusted balance sheet and income data for 20 years, utilizing selected ratios and other methods to present stock price and volume statistics, liquidity ratios, efficiency ratios, profitability ratios, capital structure ratios, and for forecasting earnings, cash flow, book value, market price, dividends, sales, etc., using non-linear growth model.

Program Objective;

To aid the student in analyzing the financial position of the company.

F017.00

Documentation information can be obtained from Mr. Nichols at California State University, Fullerton

Investment Analysis

Professor	Class	Campus
C. E. Tootle	BA 136	Sacramento

Course Description

The **analysis** of stocks and bonds of governments, municipalities, and private corporations emphasizing factors which underlie market value, including general price level, trends of interest rates, business profits, dividends, movements of security prices, portfolio management, and the role of the computer in investment analysis.

Course Objective

The development of the student's ability to use available financial and economic information to analyze and draw conclusions as to investment merits of securities.

Programs

/CURFIT/ (Timesharing)

Program Description

Provides a least-square curves fit for up to 200 observations on two variables. Six curves fitted: A linear function, exponential function, a power function and three hyperbole functions.

Program Objective

To use regression fit data to determine the nature and extent of association as a basis for predictions.

Documentation is located in **ITS Manuals.**

/MUREG/ (Timesharing)

Program Description

Performs a multiple regression analysis allowing weighting and transformations of observations any combination of variables and observations may be provided the total number of observations does not exceed 2,000 and the total number of variables in the regression equation, including the constant term does not exceed 30.

Program Objective

To use regression fit data to determine the nature and extent of association as a basis for prediction.

Documentation is located in ITS-GØ Manual.

Risk Management

Professor	Class	Campus
J.M. Stockdale	BA 143	Sacramento

Course Description

Treatment of uncertainty as to property damage liability and loss of personnel earn capacity.

Course Objective

To instruct students on the use of insurance and personnel finances.

Programs

STAT

Program Description

A set of statistical routines for use by those needing statistical analysis. This program contains the following routines: analysis of variance (VARI), canonical correlation (CAND), CHI-square (CHIS), correlation analysis (SCMR), correlation matrix (CRMX), cross tabulation (XTAB), data screening (SCRN), discriminant analysis (DISC), factor analysis (FCTO), frequency distribution (FREQ), Friedman two way analysis of variance (FTWA), Kolomgrov-Smirnov's two sample limiting distribution (KOLA), Kruskal-Wallis one-way of variance (KVAR), Mann-Whitney U Test (UTST), Multiple linear regression (MULT), polynominal regression (POLY), simultaneous equations (SIMQ), Spearman rank correlation (SRNK), stepwise multiple regression (step), tally (TALY), T-Test (TTST).

Program Objective

To give its users a large percentage of statistical routines with no programming and no computer experience.

Documentation is located in STATPAC manual.

Seminar in Investment Management

Professor	Class	Campus
J. R. Nichols	Fin 535	Fullerton

Course Description

Problems of investment and portfolio management; concepts of risk evaluation and investment criteria; analysis of interest rate movements; investment valuation and timings; regulation and administrative problems of industry.

Course Objective

To enable the student to bring together all of the knowledge he has learned in his previous finance classes and to use this knowledge to solve pertinent financial problems on his own.

Programs

COMPUSTAT QUARTERLY FINANCIAL ANALYSIS PROGRAM

Program Description

This program is the same as the Compustat Annual Financial Analysis Program except that its output is by quarter instead of by year.

Program Objective

To break down the time periods a little to give a more detailed insight into what is happening in the firms financial structure.

F018.00

Documentation information can be obtained from Mr. Nichols at California State University, Fullerton,

Senior Seminar in Finance

Professor	Class	Campus
G.R. Sanderson	Bus 279 (M.B.A.)	San Jose
J.C. Ma	Bus 179	San Jose

Course Description

An integration of the several areas of financial decision-making with emphasis on the most current issues in theory and practice.

Course Objective

To introduce the student to the current practices and problems encountered in the business world.

Programs

FINANSIM: (J.C. Ma & G.R. Sanderson)

Program Description

Each Finansim firm produces and sells an unnamed, unidentified product. For each period of play, which represents one year, Finansim managers make a number of decisions: to determine the number of production units to be manufactured; to purchase or sell marketable securities; to float new or retire existing 10-year debentures; to obtain bank-term loans to help finance company operations; to issue new common stock; to make dividend payments on existing common stock; to maintain or expand the firm's plant and machine capacity; and to invest in any or all of these different types of capital improvements; each period will effect future savings for the firm by reducing its operating costs.

Program Objectives

The advanced study of Finance through business simulation.

Documentation is located in "Computer Models in Operations Management a Computer-Augmented System," by Roz D. Harris and Michael J. Maggard. Harper and Row, 1972.

DOCUMENTATION

F014.00

PROFORMA

Data Card Formats

Card	Column	Variables
1	1-24	None
2	1	Number of periods to be forecasted (1-5)
3	1-10	Sales of list period
	11-20	Net fixed assets of list period
	21-30	Preferred Stock, common stock, and paid in surplus of list period added together.
	31-40	Retained Earnings of last period.
4	1-10	Tax Rate
	11-20	Expected Annual dividends in $
	21-30	Minimum cash balance
	31-40	Accounts receivable to sales
	41-50	Inventory to sales
	51-60	Expected annual other non-current assets
	61-70	Accounts payable as a percent of sales
5	1-10	Percent of sales increase for our previous period - 1st
	11-20	Percent of sales increase for next period - 2nd
	21-30	Percent of sales increase for next period - 3rd
	31-40	Percent of sales increase for next period - 4th
	41-50	Percent of sales increase for next period - 5th
6	1-50	Same as card 5 but contains percent that cost of goods sold is of sales
7	1-50	Same as card 5 but contains percent that selling and administrative expense is of sales
8	1-50	Same as card 5 but contains expected capital expenditures
9	1-50	Same as card 5 but contains expected depreciation.
10	1-50	Same as card 5 but contains interest income
11	1-50	Same as card 5 but contains the amount of term debt outstanding
12	1-50	Same as card 5 but contains the amount of long-term debt percent in the capital structure.
13	1- 4	"ENDR"

The program operates by calculating the funds requirements with a minimum cash balance. These needs are matched against the known funds source and the difference computed. If the difference indicates a funds surplus, this amount is added to the cash account. If a deficit exists, it is automatically met with bank loans.

INSTRUCTIONS FOR USE OF FINANALS

Enter the following data in the exact order shown below. Enter a zero if appropriate. If you do not wish to project the total number of periods possible enter zeros in the remaining designated fields. Figures should be in thousands of dollars (1 million dollars would be entered as 1000.0) except for percentages and ratios. Percentages are entered as decimals (15 percent would be entered as .15), and ratios will be entered at face value (if the inventory turnover is six times per year it should be entered as 6.0).

Always carry out the figures as far as possible without having more digits than will fit in the designated field. Always insert a decimal point unless you are told not to.

The data cards for FINANALS are formatted as follows:

Card	Column	Variable
1	1-24	Your name
2	1-16	Designation of periods (years, months, etc.)
	17-18	The number of periods to be projected plus the base period. No decimal point.
3	1-4	Number of the base period (if a year enter 1972 or whatever is the appropriate value, if a month or quarter enter a 1 or the value you wish). No decimal point.
	5-6	The first period to be printed out 1 for the base year, 2 for the year after the base year etc. No decimal point.
	7	If you want the income statement print a 1; if you don't want it, print a 0. No decimal point.
	8	If you want the statement of retained earnings, print a 1; if not a 0. No decimal point.
	9	If you want the balance sheet, print a 1; if not a 0. No decimal point.
	10	If you want the ratio analysis, print a 1; if not a 0. No decimal point.

The information on the following two cards will be the values for the base period. Enter decimal points for each value.

Card	Column	Variable
4	1-10	Total sales for the base period.
	11-20	Total value of land owned in base period.
	21-30	Total value of building in base period.
	31-40	Total value of machines and equipment in base period.
	41-50	Preferred Stock in base period.
	51-60	Common stock in base period.
	61-70	Paid in surplus in base period.
	1-10	Retained earning at the beginning of the base period.
	11-20	Tax rate as a decimal (federal tax rate).
	21-30	Annual dividends.
	31-40	Minimum cash balance.
	41-50	Receivables turnover rate (sales ÷ accounts receivable).
	51-60	Inventory turnover rate (sales ÷ Inventory)
	61-70	Current payables (including federal income tax) as a percent of sales.

The information on the following cards will designate the changes and additions that are to be made in each of the periods. There will be 13 3ntrys for each item. These entries will be one entry for each succeeding 10 card columns. This will require two cards for each item with eight entries on the first card and five on the second card. An example is given for the first item, then only the item is listed but the format will be the same as the example.

Card	Column	Variable
6	1-10	Other non current assets for base period.
	11-20	Other non current assets for 1st period projected.
	21-30	Other non current assets for 2nd period projected.
	31-40	Other non current assets for 3rd period projected.
	41-50	Other non current assets for 4th period projected.
	51-60	Other non current assets for 5th period projected.
	61-70	Other non current assets for 6th period projected.
	71-80	Other non current assets for 7th period projected.
7	1-10	Other non current assets for 8th period projected.
	11-20	Other non current assets for 9th period projected.
	21-30	Other non current assets for 10th period projected.
	31-40	Other non current assets for 11th period projected.
	41-50	Other non current assets for 12th period projected.

Card	Column	Variable
8&9		Other current assets
10&11		Other Income
12&13		Other Expense
14&15		Other liabilities
16&17		Percent of sales increase over previous period. Decimal.
18&19		Percent cost of goods sold is of sales for each period. Decimal.
20&21		Percent distribution expense is of sales for each period. Decimal.
22&23		Percent Administrative expense is of sales for each period.
24&25		Capital expense for land for each period. Since the value for the base period is already included enter 0.0 in the first 10 columns then enter the value of new land acquired in each period after that.
26&27		Capital expense for building for each period (handle the same as for land).
28&29		Capital expense for machines and equipment for each period (handle the same as for land).
30&31		Depreciation expense for building for each period.
32&33		Depreciation expense for machines and equipment for each period.
34&35		Term debt due for each period.
36&37		Long term debt payable each period.
38&39		Incoming funds (other than the net income account) for the statement of retained earnings
40&41		Outgoing funds (other than dividends) for the statement of retained earnings
42&43		Investments for each period.

The firm is required to maintain a minimum cash balance under a loan agreement. If a deficit is calculated by the program instructions you have given, the computer will automatically calculate the needed amount necessary to meet the minimum cash balance, and to obtain such through a bank loan.

Form #P09

Control
Cards

Program Name FINANALS Program Number

Applicable
Options

First Card	7 9	SEQUENCE
	7 9	JOB
	7 9	FET
	7 9	OPEN
	1 1	LOAD
	7 9	RUN
		DATA
		ENDR
	7 8	

MARKOWITZ PORTFOLIO

Sample Deck Setup

6 End Cards

5 ENDP

4 Parameter Card

3 Portfolio Name

2 MARK

1 Data and Control Cards

If more than one portfolio is to be computed, cards 3-4 must be repeated for each portfolio.

SHARPE PORTFOLIO

7 End Cards

6 ENDP

5 Index Card (Optional)

4 Parameter Card

3 Portfolio Name

2 SHAR

1 Data and Control Cards

If more than one portfolio is to be computed, cards 3-5 must be repeated for each portfolio.

NICHOLS I

Deck Setup

Card	Variable
1	Standard Job Card
2	7 Nichols 9
3	Number of companies to be examined in columns 1-4 right justified.
4	Data for each company preceded by: A) comment card identifying name of firm and ticker symbol; B) card with number of years of data in columns 102, right justified and source of information beginning in column 9.
5	End of file card.

Data Format.

Attached.

Further documentation can be found in Financial Analysis Journal, Nov-Dec. 1964, "A Computer Program for Financial Statement Analysis."

FINANCE 435
WORK SHEET

PROFESSOR JOHN R HICKMAN
SCHOOL OF BUSINESS & ECON.
DEPT. OF FINANCE

DATA SHEET, SECURITIES COMPUTER APPLICATIONS
STUDENT NAME

1ST LINE CO. NAME; TICKER SYMBOL; OTHER IDENTIFICATION
2ND LINE NO. OF YEARS OF DATA; SOURCE OF DATA

CASH & SEC. (COST)	ACC'TS REC.	INVENTR.	OPER. ASSETS	CURR LIAB.	L.T. DEBT	PFD. STOCK	COM STK. EQUITY	STOCK PRICE HIGH	STOCK PRICE LOW			

NET SALES	COST OF GOODS SOLD	DEPR.	OPERATING INCOME	FIXED CH'GS.	INCOME TAXES	NET INCOME	PFD. DIV'S	COMMON STK. DIV'S	COMMON STK. SPLITS	STOCK DIV'S & SPLITS		

F018.01

NICHOLAS II

Deck Setup

Card	Variables
1	Standard Job Card
2	7 NICHOLAS 2 9
3	Number of experiment cards. In columns 1-4, right justified, number of erogenous variables to be used is listed.
4	For each erogenous variable: A) A card, column 1-16, name of exgenous variable; column 17-20 number of years data; column 21-24 number of endogenous variables (last two items right justified). B) Title of experiment, columns 1-80. C) New Card. Data for exogenous columns 11-20; 21-30; 31-40; 41-50; 51-60; 61-70; 71-80. One data point for each field from earliest to present. If more points are required, use additional cards and the same format.
5	For each endogenous variable: A) A card with the name of particular variable. B) A card for data of that particular endogenous variable in columns 11-20; 21-30; 31-40; 41-50; 51-60; 61-70; 71-80 (use another card for more data).
6	Two end of job cards.

BABCOCK MODEL

Deck Setup

Card	Variable
1	7 Job Card. 9
2	7 BABCOCK 9
3	In column 2 put number of companies in your program.
4	In columns 2-80 company name.
5	In column 2 put number of years for this company.
6	Data cards. (for each company) End of File End of File

Input format same as for Nicholas I.

COMPUSTAT ANNUAL FINANCIAL ANALYSIS PROGRAM

Program is on tape so only one card is needed.

Column	Variable
1-5	Industry No. (Right Justified) (decimal point after number)
6-12	Company No. (Right Justified) (decimal point after number)
13-15	1st year to run Data (last 2 digits) (decimal point after number)
16-18	Last year to Run Data (last 2 digits) (decimal point after number) (last year in 1972)
19-38	Student Name - Last Only (Left Justified)
39-58	Instructor Name - "Nichols" (Left Justified)
59-66	Course No.

COMPUSTAT QUARTERLY-ANALYSIS PROGRAM

Program is on tape so only one card is needed.

Columns	Variable
1-5	Identity No. (Right Justified) (decimal point after number)
6-12	Company Number (Right Justified) (decimal point after number)
13-15	First year to run data (last 2 digits of year, followed by quarter to run data, i.e., 651 = year '65,' Quarter #1)
16-18	Last year to run data (2 digits of year followed by quarter, i.e., 724. Last year is 1972).
19-38	Student Name - Last Only (Left Justified)
35-58	Instructor Name - (Left Justified)
59-66	Course Number (Left Justified)

PREFACE

This is the Management Volume of the catalog. It contains the classes being taught under this discipline that use computer programs as instructional aids.

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Business Policies and Administration

Professor	Class	Campus
F. L. Kaufman	BUS 182	Sacramento
D. Anderson	MGMT 110B	Fresno

Course Description

The theory and practices of planning, organizing, staffing, directing and controlling as in a business environment. The use of management of human resources, development evaluation, theory of work and motivation, and the use of cost-effectiveness and social responsibility theories.

Course Objective

To allow the student to integrate all of the business and general knowledge he has acquired through practice in application of such knowledge to reach a common goal.

Programs

THE EXECUTIVE GAME: (F.L. Kaufman)

Program Description

It simulates a small industry (oligopoly) in which there are few companies manufacturing and selling a single product. It provides an imaginary business environment in which participants can practice the art and science of forward planning and decision making at the top management level.

Program Objective

To require the participants to deal simultaneously with all of the factors in the situation--production, marketing, finance, competition, inflation, in a realistic environment.

Documentation can be obtained by writing Richard D. Irwin, Inc., Homewood, Illinois, 1966.

MANSIM: (D. Anderson)

Program Description

To teach participants about decision making and strategy by giving them the opportunity to run their own business and to keep the game simple, and yet dynamic as possible, so that prime emphasis can be given to decision making and not the memorization of mechanical rules.

Program Objective

To involve the student with administrative processes: planning (a financial, marketing, and production strategy), organizing (assigning duties to team members), directing and controling (reaching to competition and/or the environment).

Documentation can be obtained by writing D. H. Mark Publishing Company, Braintree, Massachusetts, 1970.

Operations Research

Professor	Class	Campus
C. R. Necco	BA 112	Sacramento

Course Description

An introduction to deterministic models in operations research applicable to management decision making. Topics include linear mode formulation; simplex algorithm sensitivity analysis; transportation and assignment algorithms; network modules; Pert and CPM; and introduction to dynamic programming.

Course Objective

To introduce the student to the use of operations research techniques used in the management field.

Programs

/LINPRO/: (Timesharing)

Program Description

Maximizes or minimizes an objective function using the two-phase method. The coefficients of the restrictions, the constants of the restrictions and the coefficients of the objective function must be entered. LINPRO automatically supplies slack surplus and artificial variables as required for the solution. The types of output are: basis, solutions, or tableau and basis.

Program Objective

To solve problems formulated as linear programming problems.

Documentation is located in ITS-GO Manual.

Basic Management Block

Professor	Class	Campus
R. J. Piersol	MGT 101	Fresno

Course Description

A special integrative seminar covering marketing, production, administration organizational behavior. This course consists of small group projects, research, computer simulation; student planned and presented programs.

Course Objective

To integrate subject matter, to provide students the opportunity to act as managers under simulated conditions and to give students the experience of working with others in small groups.

Programs

MARKETING STRATEGY

Program Description

To expose students to the dynamics of marketing. Participants must establish company objectives and then develop strategies designed to reach their goals. They select and analyze a group of potential consumers who constitute their market target and develop a blend of marketing variables which serve as their competitive weapons in appealing to this market.

Program Objective

To give the student a real life situation in handling a marketing management situation.

Documentation can be obtained by writing Charles E. Merrill Publishing Company, Columbus, Ohio.

PROSIM

Program Description

Each firm manufactures and sells three different unidentified products. For each period of play which represents one day, managers make a number of decisions: expenditures for quality control and for plant maintenance, the placing of regular and/or expedited raw material orders,

the assignment of either of three products to each of four machines on each of two production lines, the hiring and training of workers, the assignment of workers to machines, and the number of hours of work to be scheduled for each employee.

Program Objective

To allow the student the use of a realistic situation in handling a production management situation.

Documentation can be obtained by writing International Textbook Company, Scranton, Pennsylvania, 1969.

Production Management

Professor	Class	Campus
R.D. Tellier	MGMT 124	Fresno

Course Description

Production systems and problems; facility location and design; material handling; production planning and control; purchasing; inventory control; product development; quality control; methods analysis and job design; work measurement; quantitative methods in solutions of production problems.

Course Objective

To teach the student the use of the tools used by management to accomplish its goals.

Programs

PROSIM

Program Description

Each firm manufactures and sells three different unidentified products. For each period of play which represents one day, managers make a number of decisions: expenditures for quality control and for plant maintenance, the placing of regular and/or expedite raw material orders, the assignment of either of three products to each of four machines on each of two production lines, the hiring and training of workers, the assignment of workers to machines, and the number of hours of work to be scheduled for each employee.

Program Objective

The simulation of operations function of an organization so the student can experience the trials and tribulations of operations management.

Documentation is located in A Production Management Simulation by Paul S. Greenlaw and Michael P. Hohentein, International Textbook Co., Scranton, Pennsylvania, 1969.

Operation Problem Solving

Professor	Class	Campus
R. Gilman	MAN 541	Fullerton

Course Description

A project oriented class to show the applications or problem formulating and solving techniques for special projects.

Course Objective

To apply system analysis and other dynamic techniques to current operations problems.

Programs

/CURFIT/: (Timesharing)

Program Description

Provides a least-square curve for up to 200 observations on two variables. Six curves are fitted: linear function, exponential function, a power function, and three hyperbole functions.

Program Objective

To use regression fit of data to determine the nature and extent of association as a basis for prediction.

Documentation is located in the ITS manuals.

/LINPRO/ (Timesharing)

Program Description

Maximizes and minimizes an objective function using the two-phase method. The coefficients of the restrictions, the constants of restrictions, and the coefficients of the objective functions must be entered. LINPRO automatically supplies slack, surplus, and artificial viariables as required for the solution. The type of output are: basis, solutions, or tableau and basis.

Program Objective

To solve problems formulated as linear programming problems.

Documentation is located in the ITS-GØ Manual.

/MANDSD/ (Timesharing)

Program Description

Calculates the arithmetic mean, variance, and standard deviation for up to 400 individual values or frequency distributions.

Program Objective

To use data to determine the extent of association as a basis for prediction.

Documentation is located in the ITS-GØ Manual.

/MUREG/: (Timesharing)

Program Description

Performs a multiple regression analysis allowing weighting and/or transformation of observations. Any combinations of variables and observations may be used provided that the total number of observations does not exceed 2,000 and the total number of variables in the regression equation, including the constant term, does not exceed 30.

Program Objective

To use regression fit of data to determine the nature and extent of association as a basis for prediction.

Documentation is located in the ITS-GØ Manual.

Investment Analysis

Professor	Class	Campus
C. E. Tootle	BA 136	Sacramento

Course Description

The analysis of stocks and bonds of governments, municipalities, and private corporations emphasizing factors which underlie market value, including general price level, trends of interest rates, business profits, dividends, movements of security prices, portfolio management, and the role of the computer in investment analysis.

Course Objective

The development of the student's ability to use available financial and economic information to analyze and draw conclusions as to investment merits of securities.

Programs

/CURFIT/: (Timesharing)

Program Description

Provides a least-square curves fit for up to 200 observations on two variables. Six curves fitted: a linear function, exponential function, a power function and three hyperbole functions.

Program Objective

To use regression fit of data to determine the nature and extent of association as a basis for predictions.

Documentation is located in ITS Manuals.

/MUREG/

Program Description

Performs a multiple regression analysis allowing weighting and/or transformations of observations any combination of variables and observations may be used provided the total number of observations does not exceed 2,000 and the total number of variables in the regression equation, including the constant term does not exceed 30.

Program Objective

To use regression fit of data to determine the nature and extent of association as a basis for prediction.

Documentation is located in ITS-GØ Manual.

Managerial Accounting

Professor	Class	Campus
H. A. Hoverland	AD 340	San Bernardino
J. W. Coleman	ACCT 304	Fullerton

Course Description

The study of accounting information systems as used by management.

Course Objective

To develop conceptual and manipulative capabilities concerning financial and cost data and their role in management decisions.

Programs

63 GAME (also known as HOVERLAND)

Program Description

This management game permits five teams or companies to compete in an economic market. Each team has control over a number of decision variables which will determine its success or failure in competing with each other. The basic time period involved for a given set of decisions is the quarter (i.e., three months). The results from one quarter enable each team to make further decisions for the next period. Every fourth quarter, annual statements are produced for each team.

Program Objective

To allow the participants to make managerial decisions in a simulated production and marketing environment.

MGMT 010.00

Documentation information can be obtained from Mr. Hoverland at California State College, San Bernardino.

MGMT 011.00

Research Methods in Administration

Professor	Class	Campus
J. McDonnell	AD 603	San Bernardino

Course Description

The methods and procedures used in conducting research for administrative decision making.

Course Objective

To give the student the background and ability in designing a research instrument, administering it, and analyzing the data to investigate the hypothesis.

Programs

SPSS

Program Description

Is an integrated system of computer programs for the analysis of social science data. The system has been designed to provide the social scientist with a unified and comprehensive package enabling him to perform many different types of data analysis in a simple and convenient manner. SPSS allows a great deal of flexibility in the format of data. It provides the user with a comprehensive set of procedures for data transformation and file manipulation, and it offers the researcher a large number of statistical routines commonly used in social science.

Program Objective

To allow students the use of a computer as a research tool without the knowledge of programming.

Documentation is located in "Statistical Package for the Social Sciences" published by McGraw-Hill.

BMD series

Program Descriptions

BMD01D computes simple averages and measures of dispersion of variables, omitting those values which the user specifies for exclusion from computations.

BMD08D computes two-way frequency table of input data. Frequency tables are computed from specified ranges of the original variables, variables after transgeneration, stacked variables, or combinations of these. Data input may be positive or negative integers only.

BMD08M performs factor analysis of up to 198 input variables. The factoring may be done using either covariance or correlation matrices.

BMD01S performs simple linear regression analysis on single or combined treatment groups with unequal sample sizes.

BMD02R computes a sequence of multiple linear regression equations in a stepwise manner.

Program Objective

The BMD series provides over 60 statistical analysis programs to aid in the analysis of research data.

Documentation is located in Biomedical Computer Programs, UCLA.

Risk Management

Professor	Class	Campus
J.M. Stockdale	BA 143	Sacramento

Course Description

Treatment of uncertainty as to property damage liability and loss of personnel earning capacity.

Course Objective

To instruct students on the use of insurance and personnel finances.

Programs

STAT

Program Description

A set of statistical routines for use by those needing statistical analysis. This program contains the following routines: Analysis of Variance (VARI), Canonical Correlation (CAND), CHI-square (CHIS), Correlation analysis (SCMR), Correlation Matrix (CRMX), Cross Tabulation (XTAB), Data Screening (SCRN), Discriminant Analysis (DISC), Factor Analysis (FCTO), Frequency Distribution (FREQ), Friedman Two Way Analysis of Variance (FTWA), Kolomgrov-Smirnov's Two Sample Limiting Distribution (KOLA), Kruskal-Wallis One-way of Variance (KVAR), Mann-Whitney U Test (UTST), Multiple Linear Regression (MULT), Polynominal Regression (POLY), Simultaneous Equations (SIMQ), Spearman Rank Correlation (SRNK), Stepwise Multiple Regression (step), Tally (TALY), T-Test (TTST).

Program Objective

To give its users a large percentage of statistical routines with no programming and no computer experience.

Documentation is located in STATPAC manual.

Introduction to Production Operations

Professor	Class	Campus
J. W. Gotcher	BUS 3620	Hayward

Course Description

An analysis of production operations in manufacturing and service enterprise, traditional approach to such areas as production planning, inventory control, and quality control is combined with the application of quantitative tools including theory, PERT, statistical quality control and linear programming.

Course Objective

To instruct the student on production systems so he might be able to use their tools when he comes upon a problem.

Programs

PRODUCTION MANPOWER GAME

Program Description

The purpose of this game is to demonstrate how the use of a computer can aid in arriving at complex decisions quickly and consistently. The game is played by teams of executives, using decision rules of their own choice, and the computer, using a programmed decision rule developed from experience with this type of operation.

Program Objective

To allow the user's the use of the computer as a decision making tool.

MGMT 020.00

Documentation information can be obtained from Mr. Gotcher at California State University, Hayward.

MGMT 015.00

Seminar In Policy Foundation and Economic Analysis

Professor	Class	Campus
L. J. Shuster	BPA 490	Bakersfield
J. Hightower	BAE 596	Fullerton

Course Description

A terminal integrating course. The analysis of a wide range of policy decisions which focus on the role of the executive in contemporary research and materials.

Course Objective

To allow the student to apply conceptual foundations in business to simulate problems.

Programs

MANAGEMENT GAME (J. Hightower)

Program Description

A game which was developed to present an environment in which students can become involved in the process of trying to resolve a dynamic, business-like problem over an extended period of time. The problem includes uncertain events, elements of risk, and a complex payoff function.

Program Objective

To provide opportunities to make business decisions of an overall management nature.

MGMT 021.00

Documentation information can be obtained from Mr. Hightower at California State University, Fullerton.

NEVADA MANAGEMENT GAME: (L.J. Shuster)

Program Description

This game is a business policy game designed as a general management simulation problem to provide a complex decision-making exercise. As a management game it requires participants to make decisions in each of the functional areas of marketing, production, and finance and to integrate those decisions so that the best interests of their hypothetical business firm will be served in regard to its overall goals

and aspirations. Playing the game requires a business administration student to review information and techniques that have been learned in other courses, or in practical on-the-job experience, and to put into practice many of the principles of management decision-making and forward planning.

Program Objective

To provide opportunities to make business decisions of an overall management nature.

Documentation is located in The Business Policy Game, by Richard V. Cotter, ACC Educational Dvision, Meredith Corporation, 1973.

DOCUMENTATION

MGMT 018.00

63 GAME

GENERAL DESCRIPTION

System/360 Management Game permits five (5) teams or companies to compete in an economic market. Each team has control over a number of decision variables which will determine its success or failure in competing with each other.

The basic time period involved for a given set of decisions is the quarter (i.e., three months). The results from one quarter enable each team to make further decisions for the next period. Every fourth quarter, annual statements are produced for each team.

The Game Supervisor has control over three parameters which may be varied from quarter to quarter and from company to company. These are described below.

INPUT DESCRIPTION

The Game Supervisor must supply four (4) data cards (CTL card, Z Data card, Alpha Data card, and Alpha-Prime Data card). Each team must supply one data card (Decision Data Card).

CTL DATA CARD

Card Column	Parameter
6 - 7	Quarter - This variable is equal to the quarter which is being played. Permissible values are 0 - 99. A value of "0" indicates quarter Zero which will produce initial reports for each company.
14	Short Code - Indicates what action should be taken if a negative surplus is encountered. Acceptable values and their meanings are listed in APPENDIX - A
21	Annual Statement Control - This variable normally has a value of "0" or blank indicating annual statements are to be produced every fourth quarter (0,4, 8,12...). A value of one will force statements to be produced for this quarter based on the previous four quarters.
28	Copies, Reports - This variable specifies the number of each company's quarterly report (and annual report at the end of each year) to be printed. (Maximum is 20.

Card Column	Parameter
35	Copies, Worksheets - This variable specifies the number of copies of each team's decision worksheets to be printed. Maximum is 20.

N.B. All above data must be right-justified and punched without decimal point, etc.

Z DATA CARD

Card Column	Parameter
1 - 7	Z

This parameter indicates the general state of the economy. Possible values range between +200,000 to -200,000 in steps of 1.

A value of approximately 50,000 has proven to provide a realistic rising economy, and is, therefore, recommended.

ALPHA Data Card

The value of Alpha indicates the company's effectiveness in research and development. Five Alpha values are to be given; one for each company. Possible values range between 10 and 50 in steps of "1". The effect Alpha will have on a company is determined by the difference in its value as compared to another company's value (i.e., the ratio of the two values not their actual values).

Company	Card Column	
1	6 - 7	
2	13 - 14	
3	20 - 21	Card Locations for Company Alpha Values
4	27 - 28	
5	34 - 35	

ALPHA-PRIME DATA CARD

Alpha Prime indicates the company's effectiveness in marketing. Five values must be given, one for each company. Values may range between 10 and 50 in steps of 1. All five values are given on one card having the same format as the Alpha Data Card. The effect of Alpha-Prime is measured like that of Alpha (i.e., the ration between companies.).

DECISION DATA CARD (These cards will be punched by each team and given to the Game Supervisor)

There must be one card of this type for each company. Values for the various parameters listed are chosen by each team from the "Operating Decision Information" portion of the quarterly report.

Card Column	Variable
1 - 7	Additional Plant Investment
8 - 14	Discard of Plant
15 - 21	Market Research Cost
22 - 28	Price Multiplies by 100
29 - 35	Unit Cost multiplied by 1000
36 - 42	Number of Units
43 - 49	Cost of Production
50 - 56	Marketing
57 - 63	Research and Development
64 - 70	Dividends
71 - 77	Change in Loans, Positive or Negative
78 - 80	Company Number (1 - 5)

NOTE: ALL DATA MUST BE RIGHT JUSTIFIED AND MUST NOT CONTAIN A DECIMAL POINT.

INPUT SEQUENCE OF DATA CARDS

The program must be supplied with the following Data Cards for each quarter:

Z Data Card

Alpha Data Card

Alpha-Prime Data Card

Decision Data Card for companies one through five

These cards must be in this sequence and the decision data cards must be in ascending sequence by company number

Since the program does not store results from one quarter to another, the Game Supervisor must supply it with a CTL Card

indicating what quarter is being played. Along with the Data Cards for this quarter (see above), the Data Cards for this quarter must be preceded by a similar set of Data Cards for each previous quartter including quarter Zero.

EXAMPLE: Quarter 2

	Card Type	# of Cards	
QRTO	CTL Card	1	
	A, Alpha, Alpha Prime	3	
	QRTO Decisions	5	
QRTL	Z, Alpha, Alpha Prime	3	First Team Decision
	QRTL Decisions	5	
QRT2	Z, Alpha, Alpha Prime	3	Second Team Decision
	QRT2 Decisions	5	

JOB SET-UP AND OPERATING PROCEDURES

Five or more copies of quarter "0" reports will be run off, using the quarter "0" sample control cards, to distribute among the various teams and monitoring personnel. These reports should be identical (i.e., each of the teams should have the same Alpha, Alpha Prime and Decision Data Cards).

Each team makes its decisions for Quarter 1 and submits one data card to the Game Supervisor. A complete run for the first Quarter is then made. This should be submitted as a normal batch job as shown in Appendix B. The resulting output is distributed to the teams and monitoring personnel by the Game Supervisor.

Each team then makes decisions for Quarter 2 and punches new data cards. This process continues for as many quarters as are considered useful. At each Quarter the Game Supervisor provides a new Z card, Alpha Card, and Alpha-Prime Card.

A sample data stack for two quarters is shown in Appendix B. It is important to understand that the data for all previous quarters remain in the stack when the cards for a new quarter are added.

This variable indicates what action should be taken if a Negative Surplus is encountered.

Value	Action
1	Ignore shortage and read a new decision data card for this company.
2	Accept loans up to line of credit.
3	Accept all available loans.
4	Terminate execution upon shortage.
5	Ignore shortage and continue processing.

NOTE: A value of 3 is recommended.

Also, it should be noted that the Short Code Parameter values should not be changed from quarter to quarter as this value has a bearing on the intermediate calculations for each quarter preceding the quarter presently being run.

PRODUCTION-MANPOWER GAME

The purpose of the Production-Manpower game is to demonstrate how the use of a computer can aid in arriving at complex decisions quickly and consistent The game is played by teams of executives, using decision rules of their own choice, and the computer, using a programmed decision rule developed from experience with this type of operation. The participants pretend that they are the production executives of a paint company, who must decide each month how many thousand gallons of paint should be made to fill expected orders and also what size of work force must be maintained to meet the production.

The decisions will be based upon the forecasted orders, the current manpower, and the current inventory. Since it is expensive to lay off or hire very many men in any one month, we must look ahead at the forecasted orders and build up our work force accordingly. At the same time there is a best value for the inventory to balance holding costs and "out-of-stock" costs. And, moreover, we must strike a happy balance between idle time for the work force and overtime work. In general, inventory and overtime work will act as cushions to absorb fluctuations in orders so that the manpower can be maintained at as constant a level as possible.

Use of Decision Rules

"Decision rules supplement, rather than displace, management judgment in scheduling production and employment. As such they are of great value in helping management to:

1. Quantify and use the intangibles which are always present in the backgroun of its thinking but which are incorporated only vaguely and sporadically in scheduling decisions.

2. Make routine the comprehensive consideration of all factors relevant to the scheduling decisions, thereby inhibiting judgments based on incomplete obvious or easily handled criteria.

3. Fit each scheduling decision into its appropriate place in the historical series of decisions and, through the feedback mechanism incorporated in the decision rules, automatically correct for prior forecasting errors.

4. Free executives from routine decision-making activities, thereby giving them greater freedom and opportunity for dealing with extraordinary situations."

Procedure for Playing the Game

As production executives, the members of the competing teams will decide each month what the production and manpower will be. The 3150 will also compute from its programmed decision rules the optimum production and manpower and then will compute the results of all three sets of decisions in terms of costs. The competing teams and the computer operate with exactly the same data, namely, the cost tables appended to this write-up and the forecast of sales for 12 months ahead. As decisions are made for

each month, information on the forecast for the corresponding month a year in advance should be considered in making the next month's decision.

In this version of the game, play starts on January 1, with 75 men on the payroll and 280 thousand gallons of paint on inventory as of the close of business on December 31. In general manpower should be in the range of 60 to 120 and production between 200 and 1000 thousands of gallons. For each month's play, the executive team should consider the starting values, the results to date (in months after January) the 12-month forecast, and the cost tables.

There are four costs which must be considered: regular payroll, overtime costs, hiring and layoff costs, and inventory holding costs. Although overhead and material costs are present, the production department decisions are not concerned with them in an over-all sense. The cost tables list the costs as determined by an empirical study of the company.

Regular Payroll Costs. This table shows that on the average each man has a payroll cost of $340 per month. This does not include overtime.

Hiring and Layoff Costs. The cost of hiring or laying off includes such things as reorganization costs, training or separation costs, etc., and for simplicity we shall assume that, on the average, the cost is the same whether for hiring or for layoff. The costs indicate that hiring or laying off should be done gradually over a period of several months for it becomes quite expensive to hire more than three or four men in any one month.

Overtime Costs. From this table it is seen that, for example, a work force of 90 men could make up to 500,000 gallons without overtime, although if they made much less than that there would be idle times. Each man can on the average make about 5,500 gallons per month without overtime.

Inventory Costs. This table shows relative holding costs for inventory which increases as the number of gallons in inventory increases over 320,000. When inventory gets below 320,000 out-of-stock conditions begin to take place with an increase in back orders, so an estimation of the cost of tolerating back orders accounts for the increasing inventory cost at low values of inventory. Negative inventory means all back orders. The optimum level for inventory is 320,000 gallons as far as inventory costs are concerned.

OVERTIME COST

Prod. Rate (Thous. Gallons)	No. of men	60	70	80	90	100	110	120
100								
200								
300								
350		1079						
400		4335	812					
450		8591	3934	563				
500		13947	8056	3551	331			
550		20103	13178	7539	3185	118		
600		27359	19300	12527	7039	2838		
650		35615	26422	18515	11893	6558	2508	
700		44871	34544	25503	17747	11278	6094	2197
750		55127	43666	33491	24601	16998	10680	5649
800		66383	53788	42479	32455	23718	16266	10101
850		78639	64910	52467	41309	31438	22852	15553
900		91895	77032	63455	51163	40158	30438	22005
950		106151	90154	75443	62017	49878	39024	29457
1000		121407	104276	88431	73871	60598	48610	37909

REGULAR PAYROLL COSTS

Total Work Force (No. of Men)	Regular Payroll Cost Per Month
10	$ 3400
20	6800
30	10200
40	13600
50	17000
60	20400
70	23800
80	27200
90	30600
100	34000
110	37400
120	40800

HIRING OR LAYOFF COSTS

Hired or Laid Off Per Month (No. of Men)	Hiring or Lay-off Costs
1	$ 64
2	257
3	579
4	1029
5	1608
6	2315
7	3151
8	4115
9	5208
10	6430
15	14463
20	25720

INVENTORY COSTS

Net Inventory (Actual inventory less back orders) in thous. of gals.	Net Cost Per Month
- 200	$22308
- 150	18224
- 100	14553
- 50	11294
0	8448
+ 50	6014
100	3993
150	2384
200	1188
250	404
300	33
350	74
400	528
450	1394
500	2673
550	4364
600	6468
650	8984
700	11913
750	15254
800	19008

MGMT 020.03

OUTPUT COLUMN HEADINGS

FRCST	The value of forecasted orders for this month, in thousands of gallons.
ACTL	The actual orders for the month. (This 3150 version of the game has a feature whereby the uncertainties of real life are simulated by randomly selected additions to or subtractions from the forecast (Monte Carlo Technique). The new inventory balance and costs are calculated from the actual values.
PROD	This is the production as predicted by the team, in thousands of gallons.
INV	The new inventory in thousand gallons calculated by adding last month's inventory and this month's production and subtracting this month's actual orders.
MEN	This is the manpower as decided upon by the team.
PAYROLL	This is the regular payroll cost based on the number of men.
HIRING	This represents the hiring or layoff costs for the change in the manpower from last month.
OVERTIME	This is the overtime cost for the month based upon the production and manpower decisions. No cost in this column indicates either exact matching of production and manpower or else it indicates idle time, i.e. the existing manpower is not being used to capacity. The value of 5,500 gallons as the productive capacity of one man per month without overtime can be used to check the percentage of idle time.
INV	This is the inventory holding cost based on the net inventory at the end of the month.
TOTAL	This is the total monthly cost which is the sum of the four preceding columns.

FORECASTED ORDERS
(in thousand gallons)

Jan.	730
Feb.	470
Mar.	570
Apr.	560
May	460
June	590
July	580
Aug.	440
Sept.	450
Oct.	750
Nov.	450
Dec.	630
Jan.	380
Feb.	370
Mar.	528
Apr.	720
May	420
June	800
July	565
Aug.	430
Sept.	360
Oct.	750
Nov.	683
Dec.	546
Jan.	640
Feb.	495
Mar.	585
Apr.	720
May	865
June	482
July	655
Aug.	850
Sept.	621
Oct.	450
Nov.	540
Dec.	710

VERSION 1.0

CSUF VERSION OF THE MANAGEMENT GAME
INFORMATION FOR USERS

Program HBS is a modified version of the Harvard Management Game. CSUF changes to date have primarily aimed at simplifying physical handling of the game. Major changes are described in Attachment 5.

Disk Files

Program HBS uses three permanent disk files:

1. COMMON-AREA (ITP4). Contains the current values of almost all COMMON variables (from INNUMH through ZWIP) for the last eight periods. Requires 480 blocks (60 tracks) for each industry; each period within that industry occupies 60 blocks. I/O on this unit is binary.

2. FACULTY-REPORT (File 12). Contains summarized results for the last eight periods for use in Program FACULTY. Requires 10 tracks per industry plus one block for file control information. Binary I/O.

3. PARAMETER-DECK (ITP5). Contains industry constants; requires two tracks. Standard I/O.

In addition, a temporary print file (ITP2) is used; 50 tracks are sufficient.

Program Execution

HBS reads the first two program control cards containing information which normally will remain constant throughout all periods of play:

1. Logical unit identification card (I/O Assignment Card)

2. Quarter code and number of industries card. A change in the quarter code changes the random number sequence. The number of industries is used to control the number of times Program FACULTY is executed.

If the next card is an 02 card, the initial histories are read onto ITP4 (COMMON-AREA disk file) as Period 0. The 09 card signifies the end of initial histories.

The next card is the Run card (05) and it defines the period(s) to be run. It is followed by the first industry card (13) and its decisions for all periods, then the second industry card and decisions, etc. The industry cards show the number of copies of output to be printed for each firm. Decision cards are sequenced by firm within each period. The industry structures (number of industries and number of firms within each) must be the same for each period as they were in the initial history run.

The Run card causes the initialization of the parameters and COMMON variables, then the program is executed one period at a time with the results written onto the COMMON-AREA file. Attachment 1 briefly outlines the execution of one period, and Attachments 2-4 show control card formats.

Output for each period consists of six pages per firm on 40-line paper.

Faculty Report

Program FACULTY prints a summary of game results, one industry at a time, consisting of two pages per firm plus consolidated figures for the industry. It always prints the last eight periods of game results (fewer, if prior to Period 4). It is normally run immediately after the game, but may be run at any time.

Program Limits

Number of industries: Only limit is available disk space.

Number of firms: Maximum of five firms per industry due to program size.

Number of Periods: Maximum of 20 (Periods-3 through 16).

Program Size: Requires approximately 21400 words.

Approximate Run Times for One Five-Firm Industry:

Read binary deck - 1 min.
Read initial histories - 1 min.
Execute 1 period without printing - 10 sec.
Print 1 period - 3 min.
Faculty report - 2 min.

Contents of Tape (800 b.p.i., BCD, unblocked 80, 7 TRACK)

Listing of Program HBS with four overlays

Listing of Program Faculty

Listing of parameter file creation program

Initial history for one five-firm industry (77 cards per firm)

Initial decisions for same five-firm industry (10 decision cards per period)

Sample decision set for Period 1

Following the listings and data decks are three sample deck set-ups for running:

1. Initial History Run - 2 industries, one with 5 firms, one with 3
2. Faculty Report
3. Regular Run, Period 1 - same industries

Note that initial histories and decisions are the same for each industry.

How to Get Started

1. Run the parameter file creation program. This is a permanent file and the program does not need to be run again unless parameters are changed or the file is lost.

2. Make binary decks of Program HBS (Main and 4 overlays) and Program Faculty.

3. Run Initial History. Insert the binary decks for Program HBS as indicated in the Initial History sample deck, along with appropriate overlay cards.

4. (optional) Insert binary deck for Program Faculty as indicated and run Faculty Report. If run at this point, will print Periods -3 through 0.

5. Run Period 1 as shown. Note that the RELEASE and ALLOCATE cards must be removed from Files 04 and 12 after the Initial History run. This same deck set-up would be used for all regular runs for the industries described. The only changes made from one period to the next are on the 05 Run card to indicate the period being run, and in the actual decisions themselves.

6. (optional) Run Faculty Report. If run here, will print Periods -3 through 1.

Non-Standard Runs

Up to eight prior periods may be run at once (or all 20 if beginning with initial history). Printing can be suppressed for any number of consecutive periods by adding control parameters to the Run card. (See Attachment 4, "Non-Standard Runs"). The print-suppress option is useful for testing or for re-creation of files which may have been lost.

Attachment 1 EXEQTE

	Subroutine
DO I = 1,NRFIRM	
Check decisions-adjust if necessary	CKDATA
Hire and fire men	FACTRY
Move men	
Determine time for production increase	
Production hours	
Production volume	
W.I.P. accounting	RUN
Update inventories	FACTRY
End of period accounting	
Set quality indices	QUAL
Set Sector sizes	SALES
Determine orders rec'd. for each firm and product	MARKET
Determine potential orders	MKTRES
Determine units sold, sales lost, market share	SALES
Compute business index	SALES
DO I = 1,NRFIRM	
Compute income statement for each product	ACCT
Allocate overhead	ACCT 1
Pay interest & sinking fund	FUNDS 1
Pay interest & principal on year loans	
Repay prin. on secured, unsecured, & distress loans, B.O.P	
Set up income statement for firm	ACCT 1
Issue 90-day unsecured loans, lines of credit, 1-year loans, bonds	FUNDS 2
Set up balance sheet and cash flow statement	ACCT 2
Issue secured loans, distress loans, B.O.P.	FUNDS 3
Issue stock	FUNDS 4
Adjust stock price	SELSTK
Initial stock price	STKMKT
Adjust stock price	STKMKT
Compute financial ratios	ACCT 2
DO I = 1,NRFIRM	
Print results	OUTPUT
Transform decimal to octal	OCT
DO I = 1,NRFIRM	
Write results on faculty tape	REPORT

VERSION 1.0 CONTROL CARDS
REGULAR RUN - 1 PERIOD

Attachment 1

```
(JCL ENDING WITH LOAD,10)
$RUN
GUIDANCE
CB C          (EQUILIBRIUM WIDE, DESIRED DIGHT LEVEL VIEWS,
               SEND OF INDUSTRIES)
OFFICIAL      (RUN 1 PERIOD BEGINNING WITH PERIOD #1)
13ddnnnnnnnnn (NO OF COMPANIES INCLUDED FOR FURTHER TURNOVER INDICATE)
:(DECISIONS FOR IND ddi)
:
:
13ddnnnn:.....
(DECISION FOR IND ddn)
OFF           (END OF RUN)
OFF           (END OF JOB)
(JCL FOR FACILITY REPORT)
```

VERSION 1.0 CONTROL CARDS

FULL HISTORY RUN

```
1  (JCL-ENDING WITH //OUT, //O)
2  $RUN
3  6//02C4O5I6O
4  C//  (I=SIGNIFICANT, D=INSIGNIFICANT DIGITS OF SYMBOL
5       C=NO. OF INDUSTRIES):
6  O//  (READ INITIAL HISTORIES):
7  ddi C1 C2 C3
8  (C1=NO. OF INITIAL HISTORIES   (ddi=2-DIGIT INDUSTRY NUMBER)
9  FOR IND. ddi)                 (C2=NO. OF FIRMS IN INDUSTRY ddi)
10
11 ddn C1 C2 C3
12 (INITIAL HISTORIES
13 FOR IND. ddn)
14 O9  (END OF INITIAL HISTORIES):
15 O5I-3O4  (PRINT PERIODS BEGINNING WITH PERIOD-3):
16 13dddNNNNNNNNNN  (NO. OF CYCLES TO PRINT FOR FIRM1, FIRM2-FIRM NCOMP)
17 :(INITIAL DECISIONS: IND. ddi-4PER'S)
18 :
19 :
20 :
21 13ddnNNNNNN:
22 (INITIAL DECISIONS-IND. ddn-4PER'S)
23
24 O6  (END OF RUN)
25 O8  (END OF JOB)
26 (JCL FOR FACILITY REPORT)
27
28
29
30
```

VERSION 1.0 CONTROL CARDS

REGULAR RUN - 1 PERIOD

Attachment 3

```
(JCL ENDING WITH LOAD,10)
$RUN
6,1,0,2,0,3,0,*,0,S,T,E,P,0
9,b,c          (c=EQUIVALENCE NO., b=LOGICAL DIGITS IN CF WORDS,
                c=NO. OF INDUSTRIES)
0,0,F,F,0,1    (RUN 1, PERIOD BEGINNING WITH PERIOD 1)
1,3,d,d,n,n,n
```

VERSION 10 CONTROL CARDS
NON-STANDARD RUN

```
(JCL ENDING WITH LOAD, RUN)
$RUN
GUIDANCESTEP
SUBC
OSTEPPPPPPPP   (RUN PP PERIODS BEGINNING WITH PERIOD PP)   (RUN NOT PRINTED PERIODS BEGINNING WITH PERIOD NN)
DBDCMMDDYYNNNN
*(DECISION FOR END ddmmyy PERIOD)
*
*
DBddMMMYYNNNN
*(DECISIONS FOR END ddMMMyy PERIOD)
2%
28
(JCL FOR FACULTY REPORT IF USED)
$EOF
$EOF
```

(SAME AS INITIAL HISTORY RUN)

(SAME AS INITIAL HISTORY RUN)

IF THIS ALSO AN INITIAL HISTORY RUN, INSERT { 02 / i / 04 } CARDS AS IN INITIAL HISTORY RUN

SAMPLE RUN CARDS

```
OSTAGE30002   (RUN PERIODS 1,2; PRINT DAILY PER 12)
OSTAGE02003   (RUN PERIODS 1 THRU 5; PRINT PERIODS 1 AND 5)
OSTAGE03      (RUN PERIODS 6-8, PRINT ALL)
```

CSUF Version of HBS Management Game

ADVANTAGES OF HBS OVER ORIGINAL VERSION:

- Eliminates all 4 tapes--substitutes disk storage.
- Eliminates disk error. Binary deck can now be put on disk.
- Up to 7 prior periods can be run without starting from beginning.
- Printer can be suppressed for any number of consecutive periods. (One period, one industry runs in approx. 7 seconds if not printed.)
- Faculty report does not have to be run every time.
- Main program is approximately 1300 words shorter.

MAJOR DIFFERENCES:

1. As in the original version, subroutine BINTP reads and writes the entire COMMON area from INNUMH through ZWIP each time it is called. However, unlike the original, HBS writes this COMMON block once each period instead of four times per run. This allows reruns of prior periods without starting all over.

2. The new subroutine FIND uses the LOCATE function to store 8 periods per industry. 60 blocks are allotted to each period for the COMMON area. Thus Blocks 1-60 contain Period 1, Industry 1; 61-120, Period 2, Industry 1, ..., 481-540, Period 1, Industry 2, etc. In addition, 10 blocks per period per industry are used for the Faculty Report data (File 12). FIND could easily be modified to store all periods if desired.

3. Unlike the original, cumulative profits are tallied in the main program and passed to the Faculty Report. This eliminates the need for a large segment in Part 3 of Faculty which determined where to start and stop accumulating this total. Combined with the fact that File 12 stores 8 periods at a time, the need for the Faculty Report to read and write its own tape is eliminated.

4. Function AMIN1 was removed. This changed game results somewhat from Period -2 on, since the AMIN1 in the original version only has 2 formal arguments but is called with 3 arguments in subroutine RUN. HBS uses CDC's AMIN1 which is written for 2 or more arguments. Removal of this function also resulted in elimination of the "A SYS 044 QR(C2EOU10)" error which had previously stopped the run once each period. (If the 2-argument function is inserted into HBS, the results, including the error message, are identical to the old version.)

5. Function DISERR was changed so that RANNO generates a sequence of random numbers instead of a constant. RESETU (which provides a seed value for the random number generator) is not initialized as a function of the period number and current semester (in subroutine SALES) to produce a different, yet reproducible, sequence each semester.

6. The parameters ECA, ECB, ECC were redimensioned from 100 to 32 each. The maximum number of values required for these is the total number of periods to be run plus 12; thus, 32 is sufficient to run Periods -3 through 16.

7. The following variables have been added to COMMON (but are not read and written in BINTP):

   IQTR--code number for current semester or quarter (e.g., 13 = 1st quarter 1973). Used to change random number sequence each quarter.

   NOPR1, NOPR2--control print suppress. Default to print all periods if left blank.

   IND--industry counter. Used to locate block number in FIND and to control loop in Faculty Report.

   NIN--number of industries being run. Transmitted to Faculty Report (via File 12) in order to control loop.

   ISW1--through ISW10--switches for options to be added in the future. Not used presently.

```
$JOB,0515,02769,BECK,W.&K.&M.,9494
$RAT
$RAT,B514/15
$GET,SBAE,HBS-LOAD-FILE,9604,,GAME,DECK
$OPEN,10,I
$GET,GAME,COMMON-AREA,5112,00,SAVE,ALL
$OPEN,04
$GET,GAME,PARAMETERDECK,5112,,FOR,EVER
$RELEASE,UNUSED
$OPEN,05,I
$GET,SBAE,HBS-PRINT-FILE,1458
$RELEASE,ALL
$ALLOCATE,50
$OPEN,02
$GET,GAME,FULL-112,5112,00,KEEP,OUT
$OPEN,12
$LOAD,10
$RUN
```

GAME

FAC RPT ONLY

```
1  $JOB,05150274,B=00,J.K.H.,99F
2  $FET,GAME,FILE=112,512,00,KEEP,CMT
3  $OPEN,112
4  $FET,SBAE,FAC-RPT-LOAD-FILE,9600,,FAC,DECK
5  $OPEN,20,I
6  $LOAD,20
7  $RUN
8  70 SDN FILE
9  77 ISNA FILE
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
```

PREFACE

This is the Management Information System Volume of the catalog. It contains the classes being taught under this discipline that use computer programs as instructional aids.

MANAGEMENT INFORMATION SYSTEMS

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Introduction to Management Information Systems

Professor	Class	Campus
C. Craft	BUS 490	Los Angeles
	BUS 463	San Francisco

Course Description

An introduction to the digital computer and its role as a management-oriented decision tool. Students will have an understanding of the multi-faced role of a computer systems in areas such as record keeping, accounting, procedures and management control applications.

Course Objective

To introduce students to computer programming and the basic concepts of software use by computers.

Programs

/TUTORS/ (Timesharing)

Program Description

A series of 25 programs to teach the elements of the EXBASIC programming language on Timesharing.

Program Objective

To instruct the student how to program in EXBASIC.

Documentation is located in ITS manuals.

STATPAK

Program Description

A set of statistical routines for use by those needing statistical analysis. This program contains the following routines: analysis of variance (VARI), Canonical Correlation (CANC), CHI-Square (CHS), Correlation Analysis (SIM), Correlation Matrix (CRMK), Cross Tabulation (XTAB), Data Screening (SCRM), Discriminant Analysis (DISC), Factor Analysis (FACTO), Frequency Distribution (FREQ), Fredman two-way Analysis of Variance (FTWA), Kolomgrov-Smirnov's two sample limiting distribution (KOL2), Kruskol-Wallis one-way of variance (KVAR), Mann-Whitney Utest (UTST), Multiple Linear Regression (MULT), Polynominal Regression (POLY), Simultaneous Equations (SIMQ), Spearman Rank Correlation (SRNK), Stepwise Multiple Regression (STEP), Tally (TALY), T-Test (TTST).

Program Objective

To show student an example of what is currently available to them in software without the knowledge of programming.

Documentation is located in Sacramento STATPAK manual.

Seminar in Management Information Systems

Professor	Class	Campus
D. Freedman	BA 102	Sacramento
L. W. Hein	BUS 527	Los Angeles
J. T. Sternwall	BA 279	San Diego

Course Description

Analysis, design, management, and the use of management information systems concentrating on participation of top and middle management.

Course Objective

To permit students with modest backgrounds in computer methods to influence and control the design of the management information system that they will use in decision making.

Programs

BPL: (L.W. Hein)

Program Description

BPL is the Business Planning Language. It is a sophisticated report generation language which takes advantage of the ITS system. It allows the user features like the following: easy to use syntax facilitates development of reports based on any variety of requirements, components of an organization can be interrelated to describe complicated financial flows between corporate and division or subsidiaries, financial statements can be consolidated to produce proforma corporate reports, what if question can be answered and a variety of assumptions compared immediately and routine calculations are done by the computer to aid decision making at the management level.

Program Objective

A business Planning model language designed for use by non-computer oriented students.

Documentation is located in ITS manuals.

PASSION: (J.T. Sternwall)

Program Description

A program for algebraic sequences specifically of an input-cutput nature, is a set of interrelated subroutines written by C. William Benz to perform matrix operations frequently used in input-output analysis. It has been in use since December, 1966 at Harvard Economic Research Project.

Passion was designed for those with little or no programming experience. The commands are simple and straight forward.

Program Objective

To allow the student the use of a computer without knowing programming.

Documentation can be located by writing San Diego State University Bureau of Information.

STATPAK: (D. Freedam)

Program Description

A set of statistical routines for use by those needing statistical analysis. This program contains the following routines: Analysis of Variance (VARI), Canonical Correlation (CANC), CHI-Square (CHS), Correlation Analysis (SIM), Correlation Matrix (CRMK), Cross Tabulation (KTAB), Data Screening (SCRM), Discriminant Analysis (DISC), Factor Analysis (FACTO), Frequency Distribution (FREQ), Friedman two-way Analysis of Variance (FTWA), Kilomgrov-Smirnov's two-sample Limiting Distribution (KOL2), Kruskol-Wallis one-way of Variance (KVAR), Mann-Whitney Utest (UTST), Multiple Linear Regression (MULT), Polynominal Regression (POLY), Simultaneous Equations (SIMQ), Spearman Rank Correlation (SRNK), Stepwise Multiple Regression (STEP), Tally (TALY), T-Test (TTST).

Program Objective

To show students an example of what is currently available to them in software without the knolwedge of programming.

Documentation is located in Sacramento STATPAK manual.

Integrated Data Processing Systems

Professor	Class	School
M.N. McFie	Acc 704	Fullerton

Course Description

Integrated systems for the collection, processing and transmission of information; aspects of the information services function, feasibility studies, case studies of operating systems.

Course Objective

To instruct the student in the objective design, evaluation and implementation of a programming system.

Programs

/PLOTTR/ (Timesharing)

Program Description

This program plots from one to six functions of one variable simultaneously.

Program Objective

To demonstrate to the student the versitility of the computer.

Documentation found in the ITS manuals.

/STAT/ (Timesharing)

Program Description

A package for many statistical problems (maximum size 10 variables by 150 subjects). Transformations of data may be performed. Separate instructions are available but not necessary for most users. Options include: Mean, Standard Deviation, Standard Error, maximum, minimum, range, correlation matrix, scatter diagram, histogram, multiple line plot, stepwise multiple linear regression, simple linear regression, speciman rank correlation, **polynominal** regression, Chi-Square, simultaneous equations, frequency tables, observations in given bounds, first four moments, T-tests, multiple linear regression, canonical correlation, Mann-Whitney U, Freedman 2-way ANOVA, Cochran's Q, Kendalls TAU, Discriminate analysis, factor analysis, time series.

Program Objective

A set of programs which helps the student understand the various uses of the computer in business application.

Documentation located in the ITS manuals.

/SDEP/ (Timesharing)

Program Description

This program calculates depreciation by any of four methods.

Program Objective

This program allows the student to compare the depreciation charges calculated in four different manners.

Documentation located in ITS manuals.

/LEASE/ (Timesharing)

Program Description

This program assists the user in determining whether to purchase or lease an asset.

Program Objective

To aid the student in analyzing investment options.

Documentation located in ITS manuals.

/FETCH/ (Timesharing)

Program Description

A general purpose information storage and retrieval subsystem that enables the user to establish a large data file that he can easily manipulate.

Program Objective

To introduce the student to large file structure. How to build files and how to access them.

Program Documentation is located in ITS manuals.

Electronic Data Processing for Business

Professor	Class	Campus
J. Gessford	BUS 495	Los Angeles

Course Description

Problems of programming, scheduling and feedback of accounting data under an integrated electronic system. Programming typical clerical operations; role of operations research; case studies.

Course Objectives

To prepare the student for EDP management by introducing him to quantitative techniques and giving some exposure to applications through case studies.

Programs

/CPM/ (Timesharing)

Program Description

This program error-checks the logic of a critical path network.

Program Objective

To facilitate instruction by enabling the student to handle a greater variety of critical path problems.

Documentation is located in ITS-Go manual.

Computer Methods

Professor	Class	Campus
R. Black	BUS 400	Northridge

Course Description

An introduction to sets, logic, counting, frequency distribution and probability, solving problems by the use of a **digital** computer.

Course Objective

To teach the fundamentals and techniques of programming which will enable the student to use the computer for his classwork and in industry.

Programs

/STAT/ (Timesharing)

Program Description

A package of many statistical problems. This program transforms data entered to desired output. The program can handle a maximum of 10 variables to 150 subjects. Options include mean, standard deviation, standard error, maximum, minimum, range correlation matrix, scater diagram, histogram, multiple line plot, stepwise multiple linear regression, simple linear regression, spearman rank correlation, polynominal regression, chi square, simultaneous equations, frequency tables, observations in given bounds, first four moments, T-test, multiple linear regression, canonical correlation, Mann-Whitney, Friedman 2-way ANOVA, Chochran's Q, Kenndal's TAU, discriminant analysis, factor analysis, time series.

Program Objective

To aid instruction of statistical routines by use of the computer.

Documentation is located in ITS-GO manual.

/BINDIS/ (Timesharing)

Program Description

A statistical program that will compute the probability that in a series of independent trials there will be a certain number of successes. The probability of each event occurring is equal.

Program Objective

To aid instruction of how to use probability functions.

Documentation is located in ITS-GO manual.

/PLOTTR/ (Timesharing)

Program Description

Plots one to six functions of one variable simultaneously.

Program Objective:

To aid instruction through the use of PLOTTR to plot functions.

Documentation is located in ITS-GO manual.

Digital Simulation

Professor	Class	Campus
W. M. Chow	QM 448	Fullerton

Course Description

A study of techniques using a simulation language (GPSS) that solves various discrete systems.

Course Objective

To acquaint the students with methods and applications of simulating business systems.

Programs

GPSS GENERAL PURPOSE SYSTEMS SIMULATOR

Program Description

GPSS is an application-oriented digital computer simulation language which features an elaborate software package that is designed to simplify matters for the user.

Program Objective

To enable the student to simulate digital systems derived from problems in the classroom.

MIS012.00

Documentation information can be obtained from Mr. Chow at California State University, Fullerton.

DOCUMENTATION

GPSS III FOR THE CONTROL DATA 3150 (MSOS)

1.0 Differences between GPSS III as described in the IBM Users Manual (H20-163-1) and GPSS III for the CDC 3150:

A. Cards are read until the occurrence of a START or END card. If a SIMULATE card without a * in column 1 has occurred before the START card and no errors were found, execution starts after the printing of the translated listing.

B. All cards with a * in column 1 are treated as comment cards.

C. The location field of all pseudo blocks must be numeric.

D. Only blocks with labels may be redefined after a START card.

E. Pseudo blocks. except STORAGE block, may be redefined before the occurrence of a START card and only the last definition entered will be in effect.

F. No magnetic tape operations are available using JOBTAPE control cards.

G. The HELP block is a dummy block.

H. The modifier field in a LOGIC block must be in column 14 only (R, S, I).

I. Only 3 characters of a block or pseudo block are needed in the operation field except for TABLE, TRANSFER, ASSEMBLE, and GATE which require 4.

J. All comments are suppressed on the translated listing except those on pseudo blocks and control cards.

K. The diagnostics in the IBM manuals do not apply. (See sections 1.4 and 1.5)

1.1 Limitations and known deficiencies:

A. The block counts are counted for the blocks to be executed next. For instance, if a transaction is held up in an ADVANCE block, in the block count the transaction is declared to be in the next block following the ADVANCE block.

B. Not all blocks are counted correctly. Blocks dynamically following a SPLIT or a TRANSFER BOTH or a TRANSFER ALL are not counted correctly.

C. Operand fields must begin in column 19 and are separated by commas. No embedded blanks are allowed. Any one field must have 12 or less characters.

D. QTABLE and TABULATE RT are implemented but do not work correctly.

E. A GENERATE block with an undefined number of parameters or zero parameters delivers transactions with 2 parameters.

F. Unusual combinations of characters may occur in the transalated listing when labels are used in the operand field, but the entry should be numeric.

G. No diagnostics are given for control cards, START, RESET, CLEAR or SIMULATE and STORAGE pseudo blocks.

1.2 General comments and hints:

A. Error no. 34 will occur on a GENERATE block if the FUNCTION references has an SNA with a zero argument. RN without a 1 following it is usually the cause. RN and C must always be followed by a 1.

B. The random number generator is different from the IBM version so the results in the standard output may be slightly different.

C. FUNCTIONS which reference themselves directly or indirectly will cause endless looping during execution. An example would be 10 FUNCTION FN10.

D. TABULATE blocks may tabulate nonexistent TABLES and no diagnostic is given.

E. The user is cautioned against using the PRINT or TRACE blocks. They greatly slow down the execution time and cause very large amounts of printing ot occur.

F. The simulator has not been thoroughly tested, so users are cautioned against possible erroneous results.

1.3 Maximum limits:

GPSS III for CDC 3150 has space reserved for

- 100 labels
- 30 tables
- 125 storages
- 125 queues
- 25 logic switches
- 50 savevalues
- 250 blocks, from which 100 may have more than 3 parameters.

- 10 user chains
- 450 transactions
-1800 parameters
- 500 frequency intervals (used in connection with tables)
- 125 facilities
- 100 words for variable routines
- 50 variables
- 50 functions
- 250 floating point X values for functions
- 250 floating point Y values for functions

The above values may be changed upon request.

1.4 Errors found during assembly of input.

Each card which contains an error gets in the margin of the translated listing an E followed by the number of the error and an

L if the error occurred in the location field,

O if the error occurred in the operation field (block),

A,B if the error occurred in one of those fields,

C,D if the error occurred in one of those fields,

E if the error occurred in the E field,

F if the error occurred in the F field.

A label used in the operand field and not defined in a location field is mentioned at the end of the listing with the remark UNDEFINED LABEL.

Survey of errors:

2 Unknown block

3 Label of 1 or 2 characters

4 Doubly defined label

5 Constant greater than $2^{15}-1$

6 Unknown SNA

7 Label or * not followed by + or -

8 $ not preceded by H, N, or S

9 Label not correctly composed

10 Constant greater than 128 (relative addressing)

11 Unknown operand

12 Operand is zero or blank and must not be

13 GENERATE with * in A or F field

14 GENERATE or ADVANCE field B SNA is not FN

20 Undefined location field for VARIABLE, FUNCTION, TABLE, QTABLE, or STORAGE pseudo blocks

21 Unknown label in control card

22 STORAGE defined twice

23 Unknown SNA in VARIABLE card

24 Non-numeric element in VARIABLE card

25 Unknown character in VARIABLE card

30 FUNCTION not C, D, L, M, or E

31 2 decimal points in FUNCTION X or Y value

32 Non-numeric character in X or Y entry

33 Unknown label in element VARIABLE, label used with + or - constant

34 SMA with zero or unknown argument

41 Unknown block in control card

42 Label of 1 or characters in control card

43 Unknown label in location field of control card

44 Unknown label in operand field of control card

50 Too many blocks

51 Listing too large (about 500 cards max)

52 Too many labels

53 Variable space exceeded

54 Savevalue space exceeded

55 Frequency space exceeded

60 Number of FUNCTION zero or too large

61 Number of VARIABLE zero or too large

62 Number of STORAGE zero or too large

63 Number of SAVEVALUE zero or too large

90 No FUNCTION with required number

91 No VARIABLE with required number

1.5 Errors found at execution time.

The character E is printed followed by a number. Next the chains are printed. Standard output is given, and the next card is read.

Survey of errors:

100 Available space for transactions has been exceeded

101 No memory space for transaction with the required number of parameters

102 Memory space for parameters exceeded

125 SMA with argument zero

130 Savevalue number zero or too large, SAVEVALUE block

131 Parameter number zero or too large, ASSIGN block

132 Facility number zero or too large, SEIZE, RELEASE, PREEMPT, RETURN

133 Storage number zero or too large, ENTER, LEAVE blocks

134 A facility released by a transaction not seizing it

135 A facility returned by a transaction not preempting it

136 Too many preempts (max of 7)

137 User chain number zero or too large, LINK, UNLINK blocks

138 Queue number zero or too large, QUEUE, DEPART blocks

139 Table number zero or too large, TABULATE block

140 Logic switch number zero or too large

141 More items leaving storage than entered, LEAVE block

142 More items departing queue than entered, DEPART block

150 Block number zero or too large

151 C field not greater than B field in TRANSFER PICK

152 C field - B field not multiple of D field in TRANSFER

160 Boundary exceeded in L or H function

170 Negative advance time or generate time

180 No assembly set at ASSEMBLE, GATHER, MATCH blocks

190 No FUNCTION with required number

191 No VARIABLE with required number

1.6 List of blocks available:

HELP

CHANGE

EXECUTE

INDEX

RETURN

PREEMPT

TRACE

UNTRACE

GATHER

ASSEMBLE

MATCH

DEPART

SEIZE

SPLIT

QUEUE

BUFFER

LINK

MARK

PRINT

RELEASE

TABULATE

LOOP

TERMINATE

PRIORITY

GATE

LOGIC

ENTER

UNLINK

GENERATE

LEAVE

TEST

ADVANCE

TRANSFER

ASSIGN

SAVEVALUE

1.7 List of Standard Numerical Attributes:

K	W	M	P	X	Q	QA
QC	QM	QT	QX	QZ	CH	F
FC	FR	FT	FN	V	S	SA
SC	SM	SR	ST	R	M1	MP
TB	C1	RN	PR			

PREFACE

This is the Marketing Volume of the catalog. It contains the classes being taught under this discipline that use computer programs as instructional aids.

MARKETING

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BOONEFTN	Mkt008.00

Marketing Principles

Professor	Class	Campus
M.E. Reddick	BUS 304	Los Angeles
M.A. White	BUS 208	Sacramento
D. Brooks	BA 150	San Diego
A.E. Hale	BA 150	San Diego

Course Description

Organization and operation for distribution of goods and services to all sectors of the economy. Marketing methods pertinent to manufacturers, primary producers, wholesalers, retailers, and cooperative institutions.

Course Objective

To orientate students to the interaction of marketing and management variables, both quantitative and qualitative.

Programs

BOONE (Marketing Strategy) (M.E. Reddick & M.A. White)

Program Description

To expose students to the dynamics of marketing. Participants must establish company objectives and then develop strategies designed to reach their goals. They must select and analyze a group of potential consumers who constitute their market target and must develop a blend of the marketing variables which serve as their competitive weapons in appealing to this strategy.

Program Objective

To teach students how to work with functions of pricing, production, channels of distribution and promotion in a simulated environment.

Documentation can be obtained by writing Charles E. Merrill, Publishing Co., Columbus, Ohio.

MARKETING IN ACTION: (A.E. Hale)

Program Description

A game that was developed for students who have some general knowledge of the concepts and terminology of modern marketing. It is designed for use near the end of an introductory course in marketing.

Program Objective

The simulation of a competitive market situation.

Documentation can be obtained by writing Richard D. Irwin, Inc., Homewood, Illinois. 1973 3rd Edition.

SPL (Statistical Program Library) (D. Brooks)

Program Description

A small group of ten statistical programs that are easy to use and satisfy most of the more common statistical processing needs. This package consists of the following programs: SPLØ1 Frequency Distribution I, SPLØ2 Bivariate Contingency Table Analysis, SPLØ3 Data Editing, SPL2Ø Correlation Analysis, SPL21 Stepwise Multiple Regression, SPL22 Interactive Multiple Regression, SPL4Ø Factor Analysis, SPL5Ø Analysis of Variance and T-Test, SPL7Ø Heirarchical Grouping.

Program Objective

To instruct the student how to use statistical analysis in marketing with the aid of the computer.

Mkt010.00

Documentation information can be obtained from California State University, San Diego, Bureau of Information

Marketing Management

Professor	Class	Campus
D. Brooks	BA 151	San Diego

Course Description

The managerial concepts of marketing. The development of marketing strategy and plans with the aid of social science concepts. Integrates the specific elements of the marketing function.

Course Objective

To allow the student to explore decision making in marketing.

Programs

SPL (Statistical Program Library):

Program Description

A small group of ten statistical programs that are easy to use and satisfy most of the more common statistical processing needs. This package consists of the following programs: SPLØ1 Frequency Distribution I, SPLØ2 Bivariate Contingency Table Analysis, SPLØ3 Data Editing, SPL2Ø Correlation Analysis, SPL21 Stepwise Multiple Regression, SPL22 Interactive Multiple Regression, SPL4Ø Factor Analysis, SPL5Ø Analysis of Variance, SPL51 One-way Analysis of Variance and T-Test, SPL7Ø Hierarchical Grouping.

Program Objective

To instruct the student how to use statistical analysis in marketing with the aid of the computer.

Documentation information can be obtained from California State University, San Diego, Bureau of Information.

Principles of Retailing

Professor	Class	Campus
B. Codner	BUS 344	Los Angeles

Course Description

Nature and importance of retailing. Functions of buying, stock planning, inventory control, mark-up, stock control, pricing, style merchandising, advertising, and personnel; emphasis on store location, store layout, departmentalization, and management control.

Course Objective

To give the student experience in decision making and basic concepts on using the computer, its capabilities and limitations.

Programs

BOONEFTN (Marketing Strategy):

Program Description

To expose students to the dynamics of marketing. Participants must establish company objectives and then develop strategies designed to reach their goals. They must select and analyze a group of potential consumers who constitute their market target and must develop a blend of the marketing variables which serve as their competitive weapons in appealing to this market.

Program Objective

Makes the student aware of how the computer relates to business decision making.

Documentation can be obtained by writing Charles E. Merrill, Publishing Co., Colombus, Ohio.

Marketing Research

Professor	Class	Campus
M.E. Reddick	BUS 442	Los Angeles
	BUS 446	Los Angeles

Course Description

The use of scientific methods in the formulation and solution of marketing management problems. Emphasis is on the use of marketing research as an adjunct to marketing policy formulation and on extensive application of statistical analysis and decision theory, concepts to primary and secondary data collection and interpretation.

Course Objective

To provide the student with some understanding of various multivariate techniques.

Programs

QA (QUESTIONNAIRE ANALYSIS)

Program Description

Questionnaire analysis is a special application package designed to solve the problems associated with tabulating market research survey data. It includes the following features: A flexible data format, weight capability, extensive logical capabilities that permit definition of new variables by logical means, labeling of questions and responses in the user's own terms, flexibility in definitions of output, and validation of input data.

Program Objective

To enable the user to perform questionnaire analysis, percentages, curve tabulation, and preparation for statistical analysis.

Documentation is located in ITS-QA manual.

DAY-NESS GAME (MARKETING IN ACTION)

Program Description

A game that was developed for use with students who have some general knowledge of the concepts and terminology of modern marketing. It is designed for use near the end of an introductory course in marketing.

Program Objective

To allow students to use their marketing management expertise in using the four marketing functions (product, channels, promotions, pricing).

Documentation can be obtained by writing Richard D. Irwin, Inc., Homewood, Ill. 1973 3rd Edition.

Business Decision Making In A Simulated Environment

Professor	Class	Campus
J. Villarreal	MKTG 4480	Hayward

Course Description

To allow students to make decisions in marketing, finance, production, and research and development in an interpersonal interacting environment.

Course Objective

To split students up into groups which will compete in a business decision making in a simulated business environment.

Programs

INTOP

Program Description

The International Business Operations game represents the first application of a sophisticated game design to management problems in overseas operations and in coping with overseas based competitors in domestic markets. The model around which the simulation is built also permits adaptation to purely domestic business situations without any loss in depth.

Program Objective

To provide the student an interactive environment of specialized fields to develop decision-making abilities.

Documentation is located in International Operations Simulation Player's Manual (the Free Press of Glencoe 1963).

Marketing Management Seminar

Professor	Class	Campus
M. Lupul	BUS 449	Northridge

Course Description

An advanced case approach to marketing management decisions. Emphasis is placed on the adjustments of marketing policy to changes in the economic and social environment.

Course Objective

To allow the students to make decisions as a team to give them the knowledge of how management works in a real situation.

Programs

BOONEFTN (Marketing Strategy)

Program Description

To expose students to the dynamics of marketing. Participants must establish company objectives and develop strategies designed to reach their goals. They must select and analyze a group of potential consumers who constitute their market target and must develop a blend of the marketing variables which serve as their competitive weapons in appealing to this market.

Program Objective

Makes the student aware of how the computer relates to business decision making.

Documentation is located in "A Marketing Decision Game" (Charles E. Merrill Publishing Company, Columbus, Ohio).

PREFACE

This is the Quantitative Method Volume of the catalog. It contains the classes being taught under this discipline that use computer programs as instructional aids.

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Mathematical Methods in Business and Economics

Professor	Class	Campus
M.N. McFie	QM 360	Fullerton
G. Bhaumik	QM 360	Fullerton

Course Description

Mathematical methods and their applications to business and economic problems.

Course Objective

To introduce the student to mathematical methods and their applications as used in business and economics.

Programs

QMLINPG: (G. Bhaumik)

Program Description

This program uses the (primal) Simplex algorithm to find the optimum solution to a linear programming maximization problem. The user should have at least a cursory knowledge of the linear programming model before attempting to use this program.

Program Objective

To enable the student to use more complex linear programming models.

QM029.00

Documentation information can be obtained from Mr. Bhaumik at California State University, Fullerton.

/CPM/ (Timesharing)

Program Description

This program error-checks the logic of a critical path network.

Program Objective

This program enables the student to handle more realistic CPM problems.

Documentation is located in ITS-GO Manual.

/PERT/ (Timesharing) (G. Bhaumik)

Program Description

Program Evaluation and Review Technique.

Program Objective

This program enables the student to handle more realistic PERT problems.

Documentation is located in ITS-GO manual.

/MULFIT/ (Timesharing) (M.N. McFie)

Program Description

Performs a statistical analysis for curve fitting for a maximum of 100 observations on up to 10 variables.

Program Objective

To aid instruction through the use of curve fitting functions.

Documentation is located in ITS-GO manual.

/PLOTTR/ (Timesharing) (M.N. McFie)

Program Description

Plots one to six functions of one variable simultaneously.

Program Objective

To aid instruction through the use of PLOTTR to plot functions.

Documentation is located in ITS-GO manual.

/ROOTER/ (Timesharing) (M.N. McFie)

Program Description

Solves for the roots of a polynominal of up to degree 50 using Bairstow's method.

Program Objective

To aid instruction through the use of functions for solving roots of a polynominal.

Documentation is located in ITS-GO manual.

/SIMEQB/ (Timesharing) (M.N. McFie)

Program Description

Solves up to 25 linear equations with 25 unknowns by the standard matrix inversion method.

Program Objective

To aid instruction through the use of function solving linear equations.

Documentation is located in ITS-GO manual.

/DISRAT/ (Timesharing) (M.N. McFie)

Program Description

This program will calculate the discount rate of return for a sequence of cash flows.

Program Objective

To help the student by relieving him of the tedious calculations involved with calculating discount rate of return for a sequence of cash flows.

Documentation is located in ITS-GO manual.

/SDEP/ (Timesharing) (M.N. McFie)

Program Description

Assists the user in determining which of four commonly used depreciation methods is best to use in depreciating an asset.

Program Objective

To aid in instruction through the use of determination of best depreciation method.

Documentation is located in ITS-GO manual.

/LINPRO/ (Timesharing) (G. Bhaumik & M.N. McFie)

Program Description

Maximizes or minimizes an objective function using the two-phase method. The coefficients of the restrictions, the constants of the restrictions, and the coefficients of the objective function must be entered. LINPRO automatically supplies slack, surplus, and artificial variables as required for the solution. The types of output are: basis, solutions, or tableau and basis.

Program Objective

To enable the student to gain more experience by being able to handle more complex problems.

Documentation is located in ITS-GO manual.

/STAT/ (Timesharing) (M.N. McFie)

Program Description

A package for many statistical problems. Transformations of data may be performed. Options include: mean, standard deviation, standard error, maximum, minimum, range, correlation matrix, scatter diagram, histogram, multiple line plot, stepwise multiple linear regression, simple linear regressions, Spearman rank correlation, polynominal regression, chi square, simultaneous equations, frequency tables, observations in given bounds, first four moments, T-test, multiple linear regression, canonical correlation, Mann-Whitney &, Friedman 2-way ANOVA, Chochran's Q, Kendall's TAU, discriminant analysis, factor analysis, time series.

Program Objective

To aid in instruction through the use of various statistical analysis routines.

Documentation is located in ITS-STAT manual.

KILTER: (G. Bhaumik)

Program Description

The program determines the optimum flow in a network whose arcs are subject to maximum and minimum flow restrictions, using the NETFLO out-of-Kilter algorithm.

Program Objective

To enable the student to solve network problems using the out-of Kilter Algorithm.

QM024.00

Documentation Information can be obtained from Mr. Bhaumik at California State University, Fullerton.

Electronic Data Processing for Business

Professor	Class	Campus
John Gessford	BUS 495	Los Angeles

Course Description

Problems of programming, scheduling and feedback of accounting data under an integrated electronic system. Programming typical clerical operations; role of operations research; case studies.

Course Objectives

To prepare the student for EDP management by introducing him to quantitative techniques and giving some exposure to applications through case studies.

Programs

/CPM/ (Timesharing)

Program Description

This program error-checks the logic of a critical path network.

Program Objective

To facilitate instruction by enabling the student to handle a greater variety of critical path problems.

Documentation is located in ITS-GO manual.

Linear Programming

Professor	Class	Campus
G.B. Bhahmik	QM 465	Fullerton

Course Description

The theory and applications of linear programming.

Course Objective

To teach the student theory and applications of linear programming to solving problems in business.

Programs

QMLINPG

Program Description

This program uses the (primal) Simplex algorithm to find the optimum solution to the linear programming maximization problem. The user should have at least a cursory knowledge of the linear programming model before attempting to use this program.

Program Objective

To aid instruction by enabling the student to handle more realistic linear programming problems.

QM029.00

Documentation information can be obtained from Mr. Bhaumik at California State University, Fullerton

/LINPRO/ (Timesharing)

Program Description

A linear programming technique that will maximize an objective function using the two-phase simplex method. Supplies slack, surplus, and artificial variables as required for solution.

Program Objective

To help give an instructional experience to the student that is as realistic as possible.

Documentation is located in ITS-GO manual.

Probability and Decision Making

Professor	Class	Campus
T. Murray	BA 111	Sacramento
T. E. Herbert	BA 111	Sacramento

Course Description

Application of statistical inference to business decisions under uncertainty. Bayesian methods; the general approach to deciding among alternatives and to evaluating information. Modern methods of sampling design, nonparametric inference, analysis of variance and multiple regression.

Course Objective

Introduce the student to Bayesian methods, sampling design, nonparametric inference, analysis of variance and multiple regression.

Programs

STATPAK

Program Description

A set of routines developed for those needing to do statistical analyses. The following calculations are done: analysis of variance, canonical correlation, CHI-square, correlation matrix, cross tabulation, data screening, discriminant analysis, factor analysis, frequency distribution, Friedman two-way analysis of variance, Kolomgorov-Sirnov's two sample limiting distribution, Hariskal-Wallis one-way analysis of variance, Mann-Whitney U Test, multiple linear regression, polynominal regression, simultaneous equations, Spearman rank correlation, stepwise multiple regression, tally, T-Test.

Program Objective

To enable the student to handle a wider variety of problems by freeing him from the burden of repetitious calculations.

Documentation is located in the Sacramento STATPAK manual.

Computer Methods

Professor	Class	Campus
M.N. McFie	QM 265	Fullerton

Course Description

An introduction to sets, logic, counting, frequency distribution and probability, solving problems by the use of a digital computer.

Course Objective

To teach the fundamentals and techniques of programming which will enable the student to use the computer for his classwork and in industry.

Programs

/STAT/ (Timesharing)

Program Description

A package of many statistical problems. This program transforms data entered to desired output. The program can handle a maximum of 10 variables to 150 subjects. Options include mean, standard deviation, standard error, maximum, minimum, range correlation matrix, scater diagram, histogram, multiple line plot, stepwise multiple linear regression, simple linear regression, Spearman rank correlation, polynominal regression, chi square, simultaneous equations, frequency tables, observations in given bounds, first four moments, T-test, multiple linear regression, canonical correlation, Mann-Whitney, Friedman 2-way ANOVA, Chochran's Q, Kenndal's TAU, discriminant analysis, factor analysis, time series.

Program Objective

To aid instruction of statistical routines by use of the computer.

Documentation is located in ITS-GO manual.

/BINDIS/ (Timesharing)

Program Description

A statistical program that will compute the probability that in a series of independent trials there will be a certain number of successes. The probability of each event occurring is equal.

Program Objective

To aid instruction of how to use probability functions.

Documentation is located in ITS-GO manual.

/PLOTTR/ (Timesharing)

Program Description

Plots one to six functions of one variable simultaneously.

Program Objective:

To aid instruction through the use of PLOTTR to plot functions.

Documentation is located in ITS-GO manual.

Quantitative - Interactive Decision Making

Professor	Class	Campus
P. Simis	QM 164	Fresno
J. Hightower	QM 513	Fresno
L.W. Hein	BUS 503	Los Angeles
Dr. R.W. Lodewyck	BUS 451	Stanislaus
	BUS 455	
	BUS 485	
	BUS 300	

Course Description

The use of quantitative information provided from accounting and statistical sources arriving to solutions of complex business problems. The development and application of optimization techniques to the solution of complex business problems as well as participation in interactive dynamic business games. It is recommended that the students have a business-quantitative background.

Course Objective

To familiarize the student with the application of optimization techniques to solve complex business problems. The student also gets experience in using these techniques through the use of interactive dynamics business games.

Programs

THE MANAGEMENT GAME (P. Simis)

Program Description

A top-level management simulation game covering all aspects of the business environment. In addition to student reports, a faculty report is generated which summarizes the results of the decisions for the present and preceding seven decisions.

Program Objective

Simulates a realistic business environment which allows the students to assume roles and make decisions in a manner which otherwise could be done only in an actual business. This game provides the framework around which all other class work is structured.

Documentation can be obtained writing the MacMillan Co., New York, and asking for THE MANAGEMENT GAME by McFarlan, McKenney, Sieiler.

/LINREG/ (Timesharing) (R.W. Lodewyck)

Program Description

Linear, exponential, or power function regression for data in two variables.

Program Objective

To aid in the analysis of alternative production configurations.

Documentation is located in the ITS-GO manual.

/MLREG/ (Timesharing) (R.W. Lodewyck)

Program Description

Multiple linear regression for up to 40 variables.

Program Objective

To aid in the analysis of alternative production configurations.

Documentation is located in the ITS-Go manual.

/LINPRO/ (Timesharing) (L.W. Hein & R.W. Lodewyck)

Program Description

A linear programming technique that will maximize an objective function using the two-phase simplex method. Supplies slack, surplus, and artificial variables as required for solution.

Program Objective

To aid in the analysis of alternative production configurations.

Documentation is located in the ITS-Go manual.

/TRANLP/ (Timesharing) (L.W. Hein)

Program Description

Transportation form of a linear programming problem.

Program Objective

To aid in the analysis of alternative production configurations.

Documentation is located in the ITS-GO manual.

/ALP/ (Timesharing) (L.W. Hein)

Program Description

Solves the allocation form of a linear programming problems.

Program Objective

To aid in the analysis of alternative production configuratio

Documentation is located in the ITS-Go manual.

BUSEOQ (R.W. Lodewyck)

Program Description

This program computes the Economic Order Quantity and the EOQ with one price break.

Program Objective

To give the user the ability to see what effect one change will have on the total problem.

QM023.00

Documentation information can be obtained from Mr. Lodewyck at California State College, Stanislas.

QMLINPG (J. Hightower)

Program Description

This program uses the (PRIMAL) simplex algorithm to find the optimum solution to the linear programming maximization problem. The user should have at least a cursory knowledge of the linear programming model before attempting to use this program.

Program Objective

To aid the student by enabling him to use more complex linear programming models.

QM028.00

Documentation information can be obtained from Mr. Hightower at California State University, Fullerton.

Econometrics

Professor	Class	Campus
K. T. Hsia	ECON 414	Los Angeles

Course Description

Mathematical formulation of economic models, empirical estimation methods, testing and verification; emphasis on applications to economic and business research with relevance to forecasting and policy making.

Course Objective

To give the students exposure to quantitative methods for economic and business research in theory testing, forecasting and policy making.

Programs

/ROOTR/ (Timesharing)

Program Description

Solves for roots of polynominals up to degree 50, using Bairstow's method.

Program Objective

To help derive the demand equations, cost equations, production functions from actual data.

Documentation located in ITS-GO manual.

/STAT/ (Timesharing)

Program Description

A package for many statistical problems (maximum size is 10 variables by 150 subjects). Transformations of data may be performed. Options include: Mean, standard deviation, standard error, maximum, minimum, range, correlation matrix, scatter diagram, histogram, multiple line plot, stepwise multiple linear regression, simple linear regression, Spearman rank correlation, polynominal regression, chi square, simultaneous equations, frequency tables, observations in given bounds, first four moments, T-test, multiple linear regression, canonical correlation, Mann-Whitney U, Friedman 2-way ANOVA, Cochran's Q, Hendall's TAU, discriminant analysis, factor analysis, time series.

Program Objective

Helps the student with his class work by helping to eliminate the many tedious calculations involved with this type of work.

Documentation located in ITS-GO manual.

/MLREG/ (Timesharing)

Program Description

Multiple linear regression for up to 40 variables.

Program Objective

To familiarize students in econometric work and due to the nature of course data, the student would have trouble making repetitious computations by hand.

Documentation is located in ITS-GO manual.

/MREGB/ (Timesharing)

Program Description

This program will perform stepwise multiple linear regressions according to Efroymson's algorithm.

Program Objective

To familiarize students in econometric work and due to the nature of course data the student would have trouble making repetitious computations by hand.

Documentation is located in ITS-GO manual.

Introduction to Quantitative Methods and Management Science

Professor	Class	Campus
D. Freedman	BA 103	Sacramento
J. F. Hofmann		Humboldt
A. Franklin	MGMT 3100	Hayward
	ACCT 2220	

Course Description

Introduction to mathematical concepts applicable to managerial problems. Topics include algebraic simulation, differential and integral calculus; matrix algebra, linear programming, introduction to duality, sensitivity analysis, CPM/PERT, deterministic inventory models, transportation models and decision analysis. Emphasis on problem formulation and applications.

Course Objective

To introduce the student to mathematical concepts applicable to managerial problems and to emphasize the use of these mathematical methods in problem formulation and solution.

Programs

/LINPRO/ (Timesharing) (D. Freedman)

Program Description

A linear programming technique that will maximize an objective functions using the two-phase simplex method, supplies slack, surplus, and artificial variables as required for solution.

Program Objective

To aid the student by eliminating the repetitious calculations associated with linear programming problems.

Documentation is located in ITS-GO manual.

CAC: (J.F. Hofman)

Program Description

"Comupter Augmented Cases" is a set of about 18 cases using quantitative decision tools. Each case illustrates a typical problem.

Program Objective

Aids instruction by giving the student a chance to explore alternatives by simulation and arrive at a recommended management action.

Documentation is located in "Computer Augmented Cases in Operations and Logistic Managmeent." By Berry & Whybark, So. West Publishing.

LP (A. Franklin)

Program Description

Solves linear programming problems using the simplex algorithm.

Program Objective

This program aids instruction by enabling the student to handle more complex linear programming problems.

Documentation can be obtained from Mr. Franklin at California State University, Hayward.

Quantitative Analysis for Business

Professor	Class	Campus
D. Brooks	BA 190	San Diego

Course Description

Quantitative methods applied to business decision making.

Course Objective

To familiarize the students with quantitative techniques and applications to decision making in business.

Programs

SHELL 99

Program Description:

This program will solve linear programming problems involving up to 50 constraints and 150 variables. It requires that all constraints be specified as equality constraints. This program also assumes that the objective function is to be maximized. With each inequality constraint there must be a slack variable introduced in order to arrive at a feasible solution.

Program Objective:

To enable the student to handle more realistic problems by eliminating the tedious calculations associated with linear programming problems.

QM024.00

Documentation can be obtained from Mr. Brooks at California State University, San Diego.

SPL (Statistical Program Library)

Program Description:

A small group of ten statistical programs that are easy to use and satisfy most of the more common statistical processing needs. This package consists of the following programs: SLPØ1 Frequency Distribution I, SPLØ2 Bivariate Contingency Table Analysis, SPLØ3 Data Editing, SPL2Ø Correlation Analysis, SPL21 Stepwise Multiple Regression, SPL22 Interactive Multiple Regression, SPL4Ø Factor Analysis, SPL5Ø Analysis of Variance, SPL51 One-way Analysis of Variance T-Test, SPL7Ø Hierarchical Grouping.

Program Objective:

To enable the student to handle a wiser range of problems by eliminating the many calculations associated with statistical work.

Documentation information can be obtained from California State University, San Diego, Bureau of Information.

KILTER

Program Description

The program determines the optimum flow in a network whose arcs are subjected to maximum and minimum flow restrictions, using the NETFLO out-of-kilter algorithm.

Program Objective

To enable the student to solve network problems using the out-of-kilter algorithm.

QM014.00

Documentation information can be obtained from Mr. Brooks at California State University, San Diego.

QM018.00

Applied Business and Economics Statistical Analysis

Professor	Class	Campus
T.E. Herbert	BA 202B	Sacramento
T. Chen	STAT 2010	Hayward
K.T. Hsia	BUS 209	Los Angeles
J.M. Stockdale	BA 40	Sacramento

Course Description

Descriptive statistics with applications in business and economics; source collection and presentation of data: frequency distribution, measures of location, variations, index numbers; time series; probability; hypothesis testing linear regression; sampling theory and methods; measures of central tendency and dispersion. Analysis and use of statistical methods applicable to management decision making is stressed.

Course Objective

To familiarize students with descriptive techniques applicable to business and economics, to emphasize use of statistics as a management decision making tool and to prepare students for further work in statistical inference and decision making.

Programs

/STAT/ (Timesharing) (T.E. Herbert, K.T. Hsia & J.M. Stockdale)

Program Description

A package for many statistical problems (maximum sizes is 10 variables by 150 subjects). Transformations of data may be performed. Options include: mean, standard deviation, standard error, maximum, minimum range, correlation matrix, scatter diagram, Histogram, multiple line plot, stepwise multiple linear regression, simple linear regression, Spearman rank correlation, polynominal regression, chi square, simultaneous equations, frequency tables, observations in given bounds, first four moments, T-Test, multiple linear regression, canonical correlation, Mann-Whitney U, Friedman 2-way ANOVA, Chochran's Q. Kendall is TAU, discriminant analysis, factor analysis, time series.

Program Objective

Provides a comprehensive set of statistical program.

Documentation is located in ITS-STAT manual.

CHSTAT (T. Chen)

Program Description

Will simulate the experiments which take the samples from the following distributions:

1) uniform distribution from 0 to 1.

2) normal distribution with given mean and standard deviation

3) Bernoulli distribution with given P, i.e., coin tossing.

4) six-nomial distribution, i.e., die throwing.

It will compute the sample means, statistics and x-square statistics from repeated samplings and plot into a histogram for each statistic.

Program Objective

The student learns the nature of sampling variation and can proceed through variation in sample sizes to obtain insight into the inherently increased stability of sampling distributions as sample sizes are increased. The student can gain insight thereby into the behavior of the variance of a mean and into the concepts of the Central Limit Theorem.

QM026.00

Documentation infomration can be obtained from Mr. Chen at California State University, Hayward.

Digital Simulation

Professor	Class	Campus
W. M. Chow	QM 448	Fullerton

Course Description

A study of techniques using a simulation language (GPSS) that solves various discrete systems.

Course Objective

To acquaint the students with methods and applications of simulating business systems.

Programs

GPSS (GENERAL PURPOSE SYSTEMS SIMULATOR)

Program Description

GPSS is an application-oriented digital computer simulation language which features an elaborate software package that is designed to simplify matters for the user.

Program Objective

To enable the student to simulate digital systems derived from problems in the classroom.

QM027.00

Documentation information can be obtained from Mr. Chow at California State University, Fullerton.

Managerial Decision Analysis

Professor	Class	Campus
J.M. Stockdale	BA 202	Sacramento

Course Description

Analysis and use of quantitative methods applicable to management decision making. Linear and nonlinear techniques studied; topics include algebraic simulation; max-min applications; nonlinear area determination; matrix algebra; introduction to linear programming techniques and sensitivity analysis. The course will include facility with computer techniques, computer augmented instruction used.

Course Objective

To familiarize students with topics of probability, statistical inferences, correlation and regression, hypothesis formulation and testing.

Programs

STATPAK

Program Description

A set of routines developed for those needing to do statistical analyses. The following calculations are done: analysis of variance, canonical correlation, CHI-square, correlation matrix, cross tabulation, data screening, discriminant analysis, factor analysis, frequency distribution, Friedman two-way analysis of variance, Kolomgorov-Sirnov's two sample limiting distribution, Hariskal-Wallis one-way analysis of variance, Mann-Whitney U test, multiple linear regression, polynomial regression, simultaneous equations, Spearman rank correlation, stepwise multiple regression, tally, T-test.

Program Objective

To enable the student to handle a wider variety of problems by freeing him from the burden of repetitious calculations.

Documentation located in the Sacramento STATPAK manual.

DOCUMENTATION

PROGRAM BUSEOQ

This program computes the Economic Order Quantity and the EOQ with one price break (quantity discount). It is based on Exercise 3, EOQ in "Computer Models in Operations Management. A computer-Augmented System" by Harris and Maggard.

This was originally two separate programs which were written in EXBASIC and put on the time-sharing terminal. Maximum interface with the user was a main objective. To this end, the program was written and designed so that constant user participation is necessary. Utilizing this, the user can change one input and quickly see the effect it has upon the total problem.

The list of variables, not already defined in the output (introduction to each sub-program) are given below.

X = counter for determining if the introduction to the EOQ sub-program should be given.

Y = counter for determining if the introduction to the Price-Break sub-program should be given.

G$ = 'G', C1 = assure the bell ringing when a response by the user is required.

A$, B$, Z$ - string variables which allow for work input to answer questions.

QO = optimum quantity (output).

The workings and logic of the program are as follows.

When the program is initially called up, the counters, X and Y, are set equal to zero. The "initial question" then determines which sub-program is desired. If the answer is yes, then PB is used, if the answer is no, then EOQ is used. If the counter (X or Y) equals one, then the introduction to the sub-program is printed. If it is the second or greater time it has been run (each sub-program), then the input data is immediately requested. Statement 1210 allows for a return to the initial question (1030) for correct input.

1235 EOQ Sub-program begins here, ends at 1630.

This is a simple, straight forward computation and output of data explained in 1250-1340. Line 1410 references the computations in PB. Line 1580 allows a return to the initial question which allows a loop back into either sub-program.

1635 PB Sub-program begins here, ends at 2450.

If the input discount price is not less than the normal price, the program asks for the correct data (1850-1880) and rechecks to assure correct data.

For the computation of the three possibilities, refer to the program listing, lines 1885, 1935. 1985-1990, indicate that the quantity is a given and therefore 2040 is not computed. This data is then printed out on three lines to show all possibilities.

This output is then evaluated to determine the most economical order quantity, which is printed (see flowchart for logic).

A return to the initial question is then provided.

SNELL99

This program will solve linear programming problems involving up to 50 constraints and 150 variables. It requires that all constraints be specified as equality constraints. The program also assumes that the objective function is to be maximized. With each inequality constraint there must be a slack variable introduced in order to arrive at a feasible solution.

INPUT

```
*ØJOBØACCT=NNNNNØUSER=NNNNNNNNNNØTIME=600
//ØEXECØSNELL99
```

DATA CARD 1: Problem title card (column 1-48)

DATA CARD 2: Number of constraints (columns 1-4); Number of variables (columns 5-8). Right justify with no decimal points.

DATA CARD(S) 3: Constraint card. One card is required for each constraint. Name of constraint (column 1-4); Value of RHS parameter (column 15-26). The values of each RHS parameter have to be given as decimal numbers with a decimal point.

Example:

EQ1	75.
EQ2	6.

DATA CARD(S) 4: Variable cards. One card is required for each variable. Name of variable (columns 9-12); Value of objective function coefficient (columns 15-26). The values of the objective function coefficients have to be given as decimal numbers with a decimal point. Be sure and introduce at this point a slack variable for each equation.

Example:

X	40.
Y	2.5
SL1	(zeros will be placed automatically)

DATA CARD(S) 5: LHS coefficient cards. One card is required for each nonzero LHS coefficient. Names of constraints (columns 1-4); names of variable (columns 7-10); value of LHS coefficient (columns 13-24). The values of the LHS coefficients have to be given as decimal numbers with a decimal point. Specify a slack variable with each inequality. These coefficients make up the constraint matrix.

Example:

EQ1	X	5.	
EQ1	Y	.2	
EQ1	SL1	1.	(always enter 1. when a slack variable)

DATA CARD 6: End-of-data card. Write SOLVE (columns 1-5)

```
/*
/&
```

Consider the following example problem.

```
Max 40X + 50Y          s.t.
X,Y
X + 2Y    ≤ 720
5X + 4Y   ≤ 1800
3X + Y    ≤ 900
```

The input deck will be as follows:

```
*ØJOBØACCT=NNNNØUSER=NNNNNNNNNØTIME=600

//ØEXECØSNELL99

EXAMPLE PROBLEM I

ØØØ3ØØØ5

EQ1                                720.
EQ2                               1800.
EQ3                                900.
                    X               40.
                    Y               50.
                    S1
                    S2
                    S3

EQ1       X                         1.
EQ1       Y                         2.
EQ1       S1                        1.
EQ2       X                         5.
EQ2       Y                         4.
EQ2       S2                        1.
EQ3       X                         3.
EQ3       Y                         1.
EQ3       S3                        1.
SOLVE
/*
/&
```

PROGRAM KILTER

Purpose

To determine the optimum flow in a network whose arcs are subjected to maximum and minimum flow restrictions, using the NETFLO out-of-kilter algorithm. The cost per unit of flow for each arc is specified and flow into each node is conserved.

Input

A data set consists of one Card 1, a Card 2 for each arc in the network, and one Card 3. Any number of data sets may be batched.

It will be assumed that the nodes in the network are numbered sequentially, beginning with the number 1.

Card 1	Columns 1-80	Title of problem, free field.
Card 2	Columns 1-5	Beginning node of arc.
	6-10	Ending node of arc.
	11-20	Minimum flow of arc.
	21-30	Maximum flow of arc.
	31-40	Unit cost of flow in arc.

(NOTE: Values are read in floating-point format and converted to integer to allow placement anywhere in field. Therefore, all values should be integer, and either right-justified or followed by a period.)

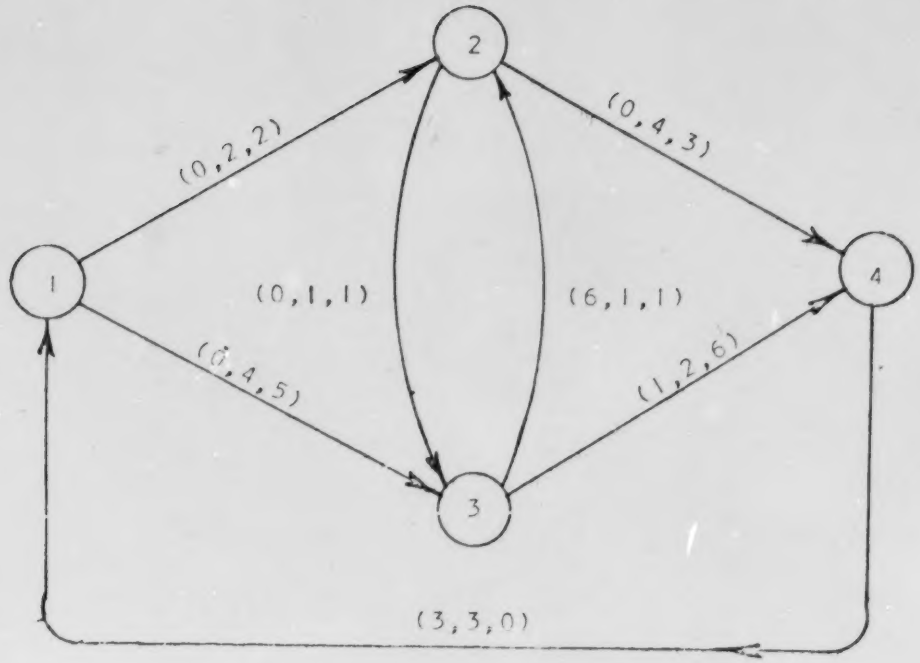
Card 3	Columns 1-80	Blank

Output

1. Title of the problem.
2. Listing of the input data, including:
   a. Number of nodes, number of arcs.
   b. For each arc: assigned arc number, end nodes, minimum flow, maximum flow, and unit cost.
3. A diagnostic, if solution is infeasible. A network is deemed infeasible if on a given arc the minimum flow is greater than the maximum flow. It is also necessary that capacities allow conservation of flow at the nodes.
4. If the solution is feasible:
   a. The arc numbers, followed by the optimum flow on that arc.
   b. The node numbers, followed by the corresponding pi values.

Additional notes

The maximum number of nodes is 100 and the maximum number of arcs is 200. Arcs may be placed between any pair of nodes as many times as desired. Negative costs, max and min flows are allowable.




```
$JOB,05990372,B=11,BHAUMIK
$KILTER
SAMPLE NETWORK PROBLEM
     1     2          0          2          2
     1     3          0          4          5
     2     3          0          1          1
     2     4          0          4          3
     3     2          0          1          1
     3     4          1          2          6
     4     1          3          3          0
(blank card)
$EOF
$EOF
```

SAMPLE NETWORK PROBLEM

NODES = 4 ARCS = 7

ARC	FROM	TO	LO	HI	U COST	FLOW(ARC)	COST
1	1	2	0	2	2	2	4
2	1	3	0	4	5	1	5
3	2	3	0	1	1	0	0
4	2	4	0	4	3	2	6
5	3	2	0	1	1	0	0
6	3	4	1	2	6	1	6
7	4	1	3	3	0	3	0

TOTAL COST AT OPTIMALITY = 21

NODE	PI(NODE)
1	0
2	4
3	5
4	7

The program CHSTAT will simulate the experiments which take the samples from the following distributions: 1. the uniform distribution from 0 to 1, i.e. a random number. 2. the normal distribution with given mean and standard deviation. 3. the binomial distribution with given p (the probability of success at each trial) i.e. coin tossing experiment. 4. the six-nominal distirubtion, i.e. die throwing experiment. After obtaining MSIZE samples, the program will compute the sample mean of these MSIZE samples. It will generate enough samples to give you NSTAT sample means of size MSIZE. It has the capability to compute the t statistics and generate the confidence intervals besides the sample means. The program will produce a list and a histogram for the sample means, or the t statistics.

The input parameters are

(on the first data card)

NSTAT: the number of sample means or t statistics you want to generate (3 spaces, should be 100 and 400)

JDIST: which distribution (3 spaces)
001 - uniform
002 - normal
003 - binomial
004 - six-nomial

PAR1: the mean of the distribution, required for normal and binomial distributions (5 spaces including the decimal point)

PAR2: the standard deviation of the distribution, required for normal distribution (5 spaces including the decimal point)

(on the second data card)

ITYPE: which statistics (3 to 15 spaces)
001 - sample means, 002 - t statistics, 003 - X statistics, 004 - confidence intervals, 005 - all of them.

(on the third card)

MSIZE: the sample size for each sample mean or t statistics (3 spaces, should be 001 and 100)

TA: to (the value used to construct confidence intervals (5 spaces, include a decimal point)

The job is set up as follows:

$JOB card (see the Computing Lab. User's Guide UG001. Your account numbers are 8420101U and 8420103G)
$CTO, 3MIN, 30PAGES
$FET, CHEN, CHSTAT
$OPEN, 25, I
$LOAD, 25
$$UN, NM
1 or 2 or 3 or 4 or 5

EOF card (obtained from Lab. assistant)
You can choose any one of the following five sets:

The distribution of sample means

1.
```
400001
001
002
003
005
010
050
999
```

2.
```
4000025.0002.000
001
002
003
005
010
050
999
```

3.
```
4000030.3
001
002
003
005
010
050
999
```

4.
```
4000030.5
001
002
003
005
010
050
999
```

5.
```
400004
001
002
003
005
010
050
999
```

GPSS III FOR THE CONTROL DATA 3150 (MSOS)

1.0 Differences between GPSS III as described in the IBM Users Manual (H20-163-1) and GPSS III for the CDC 3150.

A. Cards are read until the occurrence of a START or END card. If a SIMULATE card without a * in column 1 has occurred before the START card and no errors were found, execution starts after the printing of the translated listing.

B. All cards with a * in column 1 are treated as comment cards.

C. The location field of all pseudo blocks must be numeric.

D. Only blocks with labels may be redefined after a START card.

E. Pseudo blocks. except STORAGE block, may be redefined before the occurrence of a START card and only the last definition entered will be in effect.

F. No magnetic tape operations are available using JOBTAPE control cards.

G. The HELP block is a dummy block.

H. The modifier field in a LOGIC block must be in column 14 only (R, S, I).

I. Only 3 characters of a block or pseudo block are needed in the operation field except for TABLE, TRANSFER, ASSEMBLE, and GATE which require 4.

J. All comments are suppressed on the translated listing except those on pseudo blocks and control cards.

K. The diagnostics in the IBM manuals do not apply. (See sections 1.4 and 1.5)

1.1 Limitations and known deficiencies:

A. The block counts are counted for the blocks to be executed next. For instance, if a transaction is held up in an ADVANCE block, in the block count the transaction is declared to be in the next block following the ADVANCE block.

B. Not all blocks are counted correctly. Blocks dynamically following a SPLIT or a TRANSFER BOTH or a TRANSFER ALL are not counted correctly.

C. Operand fields must begin in column 19 and are separated by commas. No embedded blanks are allowed. Any one field must have 12 or less characters.

D. QTABLE and TABULATE RT are implemented but do not work correctly.

E. A GENERATE block with an undefined number of parameters or zero parameters delivers transactions with 2 parameters.

F. Unusual combinations of characters may occur in the transalated listing when labels are used in the operand field, but the entry should be numeric.

G. No diagnostics are given for control cards, START, RESET, CLEAR or SIMULATE and STORAGE pseudo blocks.

1.2 General comments and hints·

A. Error no. 34 will occur on a GENERATE block if the FUNCTION references has an SNA with a zero argument. RN without a 1 following it is usually the cause. RN and C must always be followed by a 1.

B. The random number generator is different from the IBM version so the results in the standard output may be slightly different.

C. FUNCTIONS which reference themselves directly or indirectly will cause endless looping during execution. An example would be 10 FUNCTION FN10.

D. TABULATE blocks may tabulate nonexistent TABLES and no diagnostic is given.

E. The user is cautioned against using the PRINT or TRACE blocks. They greatly slow down the execution time and cause very large amounts of printing ot occur.

F. The simulator has not been thoroughly tested, so users are cautioned against possible erroneous results.

1.3 Maximum limits·

GPSS III for CDC 3150 has space reserved for

- 100 labels
- 30 tables
- 125 storages
- 125 queues
- 25 logic switches
- 50 savevalues
- 250 blocks, from which 100 may have more than 3 parameters.

- 10 user chains
- 450 transactions
-1800 parameters
- 500 frequency intervals (used in connection with tables)
- 125 facilities
- 100 words for variable routines
- 50 variables
- 50 functions
- 250 floating point X values for functions
- 250 floating point Y values for functions

The above values may be changed upon request.

1.4 Errors found during assembly of input.

Each card which contains an error gets in the margin of the translated listing an E followed by the number of the error and an

L if the error occurred in the location field,

O if the error occurred in the operation field (block),

A,B if the error occurred in one of those fields,

C,D if the error occurred in one of those fields,

E if the error occurred in the E field,

F if the error occurred in the F field.

A label used in the operand field and not defined in a location field is mentioned at the end of the listing with the remark UNDEFINED LABEL.

Survey of errors:

2 Unknown block

3 Label of 1 or 2 characters

4 Doubly defined label

5 Constant greater than $2^{15}-1$

6 Unknown SNA

7 Label or * not followed by + or -

8 $ not preceded by H, N, or S

9 Label not correctly composed

10 Constant greater than 128 (relative addressing)

11 Unknown operand

12 Operand is zero or blank and must not be

13 GENERATE with * in A or F field

14 GENERATE or ADVANCE field B SNA is not FN

20 Undefined location field for VARIABLE, FUNCTION, TABLE, QTABLE, or STORAGE pseudo blocks

21 Unknown label in control card

22 STORAGE defined twice

23 Unknown SNA in VARIABLE card

24 Non-numeric element in VARIABLE card

25 Unknown character in VARIABLE card

30 FUNCTION not C, D, L, M, or E

31 2 decimal points in FUNCTION X or Y value

32 Non-numeric character in X or Y entry

33 Unknown label in element VARIABLE, label used with + or - constant

34 SMA with zero or unknwo argument

41 Unknown block in control card

42 Label of 1 or characters in control card

43 Unknown label in location field of control card

44 Unknown label in operand filed of control card

50 Too many blocks

51 Listing too large (about 500 cards max)

52 Too many labels

53 Variable space exceeded

54 Savevalue space exceeded

55 Frequency space exceeded

60 Number of FUNCTION zero or too large

61 Number of VARIABLE zero or too large

62 Number of STORAGE zero or too large

63 Number of SAVEVALUE zero or too large

90 No FUNCTION with required number

91 No VARIABLE with required number

1.5 Errors found at execution time.

The character E is printed followed by a number. Next the chains are printed. Standard output is given, and the next card is read.

Survey of errors:

100 Available space for transactions has been exceeded

101 No memory space for transaction with the required number of parameters

102 Memory space for parameters exceeded

125 SMA with argument zero

130 Savevalue number zero or too large, SAVEVALUE block

131 Parameter number zero or too large, ASSIGN block

132 Facility number zero or too large, SEIZE, RELEASE, PREEMPT, RETURN

133 Storage number zero or too large, ENTER, LEAVE blocks

134 A facility released by a transaction not seizing it

135 A facility returned by a transaction not preempting it

136 Too many preempts (max of 7)

137 User chain number zero or too large, LINK, UNLINK blocks

138 Queue number zero or too large, QUEUE, DEPART blocks

139 Table number zero or too large, TABULATE block

140 Logic switch number zero or too large

141 More items leaving storage than entered, LEAVE block

142 More items departing queue than entered, DEPART block

150 Block number zero or too large

151 C field not greater than B field in TRANSFER PICK

152 C field - B field not multiple of D field in TRANSFER

160 Boundary exceeded in L or H function

170 Negative advance time or generate time

180 No assembly set at ASSEMBLE, GATHER, MATCH blocks

190 No FUNCTION with required number

191 No VARIABLE with required number

1.6 List of blocks available:

HELP

CHANGE

EXECUTE

INDEX

RETURN

PREEMPT

TRACE

UNTRACE

GATHER

ASSEMBLE

MATCH

DEPART

SEIZE

SPLIT

QUEUE

BUFFER

LINK

MARK

PRINT

RELEASE

TABULATE

LOOP

TERMINATE

PRIORITY

GATE

LOGIC

ENTER

UNLINK

GENERATE

LEAVE

TEST

ADVANCE

TRANSFER

ASSIGN

SAVEVALUE

1.7 List of Standard Numerical Attributes

K	W	M	P	X	Q	QA
QC	QM	QT	QX	QZ	CH	F
FC	FR	FT	FN	V	S	SA
SC	SM	SR	ST	R	M1	MP
TB	C1	RN	PR			

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INSTRUCTIONS FOR USING QMLINPG - LINEAR PROGRAMMING PACKAGE

I. General Description

This program uses the (primal) Simplex algorithm to find the optimum solution to the linear programming maximization problem.[1]

The user calls the program with standard control cards, includes an 80-character "heading" card, specifies on a single card the size of the problem, the output desired, and follows this problem specification card with the detail of the problem itself. This detail will be referred to as the Tableau.

The program prints the Tableau as entered, to enable the user to check for errors. The program then applies the Simplex algorithm to solve the problem, printing out the intermediate solution steps, if desired. The final solution is printed, giving the optimum values of basic variables, the optimum objective function, and the shadow costs of nonbasic variables (dual solution). (Basic variables are those with nonzero values.

II Preparation of Initial Tableau

Consider the following example:
A company produces plumbing fixtures of two types, chrome-plated and brass. Profit is $5 per case on chromed fixtures and $3 per case on brass. Fifteen man-hours per day of unskilled labor and ten man-hours per day of skilled labor are available. A case of chromed fixtures requires 4 man-hours of unskilled and 6 man-hours of skilled labor. The corresponding labor for brass is 4 and 2 man-hours. Find the optimum daily production of fixtures in cases.

---

1. Minimization problems may be reformulated for this program, (i.e., for objective function F, Min [F] may be stated as Max [-F]. Here, as elsewhere, it is assumed that the reader has at least cursory knowledge of the Linear Programming model.

The user would proceed as follows:

Let X_1 = cases of chrome fixtures per day

X_2 = cases of brass fixtures per day

Maximize $5X_1 + 3X_2$ (the profit objective function)

subject to: $4X_1 + 4X_2 \leq 16$ (unskilled labor restraint)

$6X_1 + 2X_2 \leq 12$ (skilled labor restraint)

$X_1, \quad X_2 \geq 0$ (implicit non-negativity requirement of L.P.)

Initial Tableau: Numbers of basis variables form the first row.

Coefficients of the objective function are always negated for use in this program. The negated objective function forms the second row of the Tableau. The following rows of the initial Tableau must appear with slack variables inserted to replace the inequalities with equalities.[2] Since both restraints in this problem are of the "$\leq$" type no further adjustment is necessary. The number of slack variables is equal to the number of variables in the initial problem. The number of variables in the Tableau is 4 (two initial variables and two slacks). There are two restraints.

Exhibit 1 shows the precise relationship and format of the input cards for this problem. Exhibit 2 is an input listing and QMLINPG solution, along with a graphical solution for comparison.

III. Sensitivity Analysis

Once we have reached an optimum, we might ask, "how much can the original profit function or man-hour constraints be changed before the present solution no longer remains optimal".

The program will optionally provide the user with an automatic test of each coefficient in the profit function (or, more

---

2. This requirement, and others appearing herein, is imposed for didactic purposes. An experienced L.P. user will find highly simplified packages available for applications.

generally, objective function) and man-hour constraints (or Right Hand Side). The output is the maximum additive amount for each coefficient. A "1.0" inserted under "Objective" or under "R.H.S." on the problem specification card will produce this automatic sensitivity analysis. Exhibit 3 is a partial listing of this analysis on the problem shown in Exhibit 2.

IV. Constraints Other than "≤"

Let us change the previous problem so that precisely 12 man-hours of skilled labor must be used and at least 2 cases of chrome fixtures must be produced. The system is now:

Maximize $5X_1 + 3X_2$

subject to $4X_1 + 4X_2 \leq 16$ (as before)

$6X_1 + 2X_2 = 12$ (now an equality restraint)

$X_1 \geq 2$ (new restraint)

The first constraint requires one slack variable as before. The second (equality) constraint requires a "Big M" coefficient for an artificial variable in the objective function[3], which assures that this variable will not appear in the final solution. The "≥" constraint requires both an artificial variable with "Big M" coefficient and a surplus variable. Therefore, the number of variables in the initial tableau is 2(initials) + 1(slack) + 1(artificial) + 2(artificial and surplus) or six in all. The result is shown in Exhibit 4.

V. Restrictions, Messages, and Options

A. Program Limitations

1. The maximum problem specification allowable is 30 constraint equations and 70 variables, with the additional constraint that the product of the number of rows and columns in the tableau cannot exceed 2000

---

3. The "BIGM" coefficient is equivalent to a huge cost for the slack (or, in this usage, "artificial") variable which is so high as to insure that the value of the artificial will always remain zero. Hence, a "≤" relation with zero slack is essentially "=".

2. The program must be supplied with an initial basic feasible solution, or a Tableau which may be converted to a basic feasible solution by the "Big M" pivoting technique.
3. The basic variables in the initial Tableau must be specified by the user. (Exhibit 1).
4. The objective function is always maximized and must be supplied by the user with signs negated. Of course, this does not limit solutions to profit maximization.
5. All numerical information supplied by the user must have imbedded decimal points. Ten-column fields are used throughout. Missing decimal points will cause data to be scaled to some number less than one.
6. Very large problems may require more than the 3-minute batch processing time limit. Programs exceeding this limit are terminated in progress and returned incomplete. In these cases, please see the computer center staff and arrange special operation.
7. Blank, or zero-punched fields must be provided for all zero entries. Thus, for each row of the Tableau there will be a number of cards equaling, or just exceeding, the number of columns divided by 8. An 8 variable problem requires two cards for each restraint and the objective function, but only one for basis variables.

B. Diagnostic Messages

1. xxxx EQUATIONS ILLEGAL
2. xxxx VARIABLES ILLEGAL
3. TABLEAU EXCEEDS xxxx ELEMENTS
4. TABLEAU ENTERED (displayed exactly as read)

5. INITIAL TABLEAU (signals successful, "BIG M" pivoting)
6. INFEASIBLE BASIS (indicates a user error in preparing initial basic solution, check keypunching too.)
7. UNBOUNDED (signals that solution is infinite)
8. "Degeneracy" caused by a tie for leaving is signalled by a "*" on the output beside the number of the variable leaving the basis after a degeneracy is detected during an iteration. The program automatically breaks any ties for leaving variable by incrementing slightly the right hand side of the constraints involved.

C. Options on Problem Specification Card

1. Two copies of input tableau and final solution (one for instructor, one for student) may be requested (Exhibit 1).
2. Printout of all intermediate tableaus may be requested. (Exhibit 1).
3. Sensitivity analysis, involving either or both objective function and right hand side may be requested:
   a. Automatically by "1.0" punched in proper columns. (Exhibit 1)
   b. On any change vector specified by the user. The number of change vectors for either objective or right side sensitivity is signalled by a <u>negative</u> number (Exhibit 1). Thus, five objective vectors are specified by a "-5.0" entry on the problem specification card.

VI. Other Applications

A. Improved accuracy of a solution may be obtained by running the problem again, specifying the solution of the first run as the initial basis for the second.

B. Multiple problems may be solved with one run. They should be stacked sequentially following the "QMLINPG" control card, and followed by the "*END" card. Each problem has its own "heading card". The user is advised that any diagnostic occurring during problem solutions (see § V-B) will cause that problem, and all following problems, to be abandoned.

EXHIBIT 1

DECK SET-UP

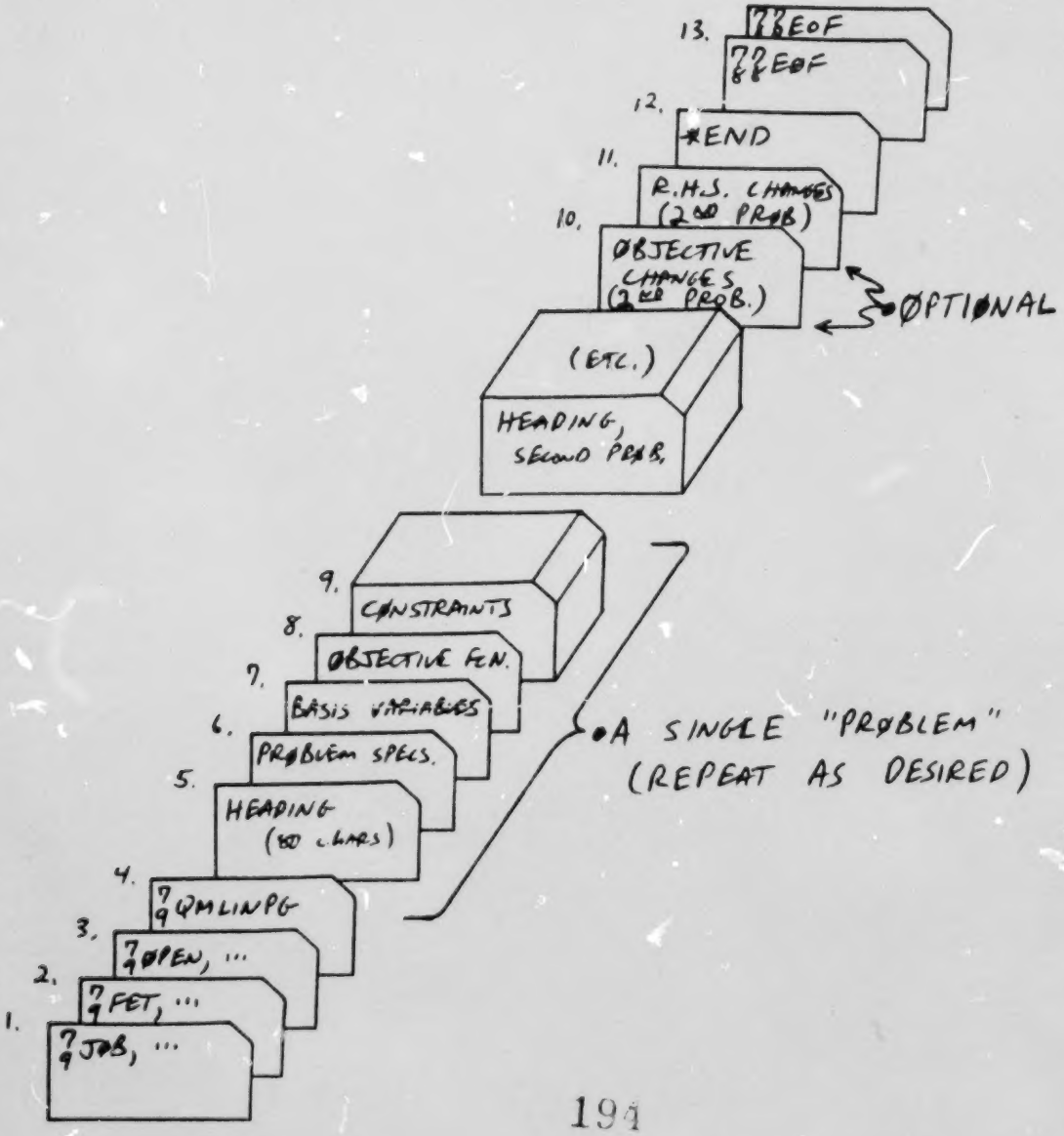


EXHIBIT 1

DECK SET-UP

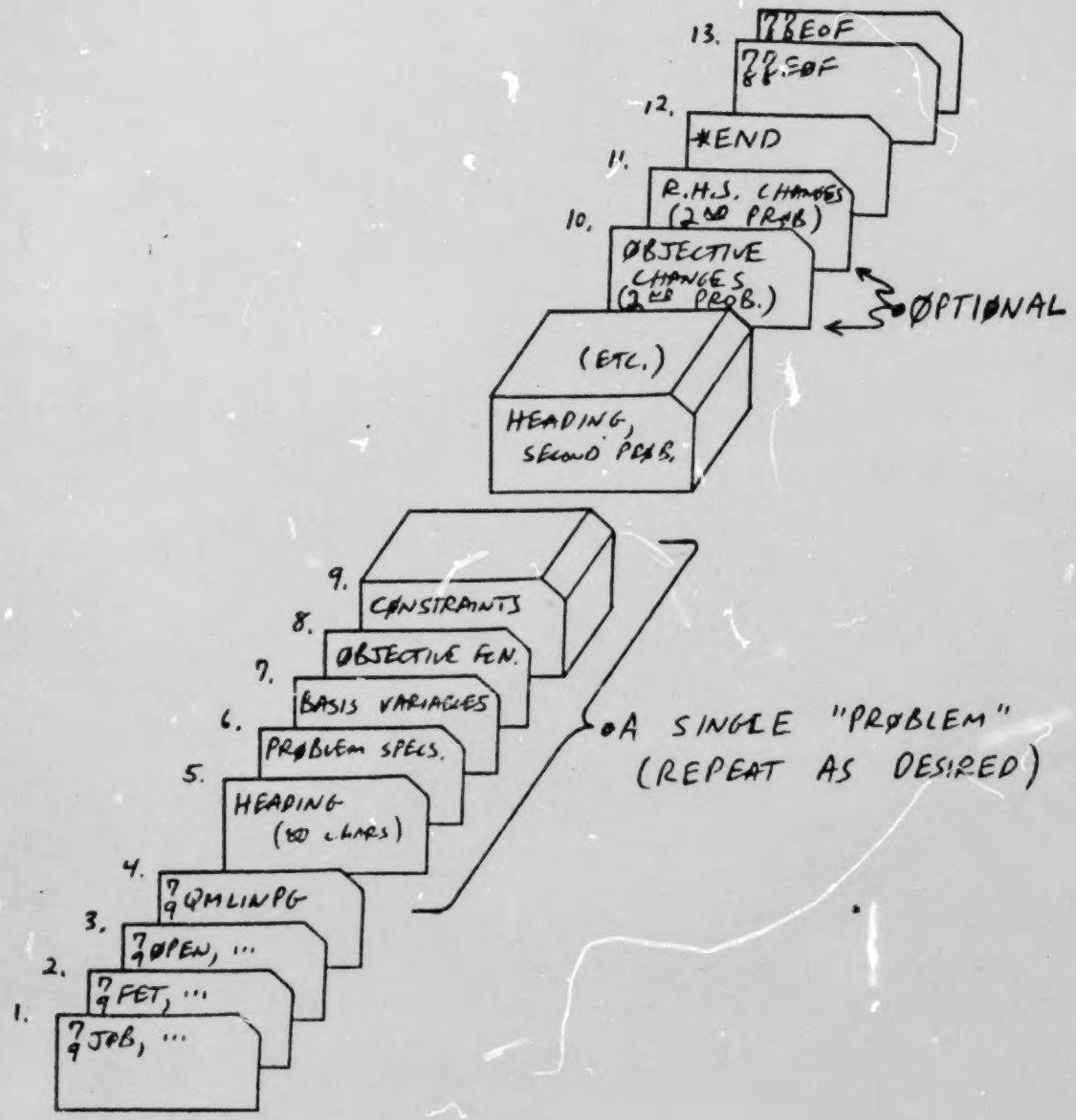


EXHIBIT 2

CARD LAYOUTS

MULTIPLE LAYOUT FORM

FOR ELECTRIC ACCOUNTING MACHINE CARDS

INTERPRETER SPACING

DATE _____

QM029.08

(1) STANDARD JOB CARD

7 9 JOB,$0000000, BROWN ,001,,SAMPLE RUN OF L.P.

(2) LOCATE O'LY FILE

7 9 FET,QMDEPT,LINPG,512,00,,XXXX

(3) OPEN

7 9 OPEN,20

(4) CALL MAIN

7 9 QMLINPG

(5) HEADING

← 80 characters →

(6) PROBLEM SPECIFICATION CARD

NUMBER OF CONSTRAINTS	NUMBER OF VARIABLES	0.- SINGLE 1.- DOUBLE OUTPUT COPIES	0.- NO 1.- YES INTERMEDIATE TABLEAUS	OBJECTIVE SEN. 1.0 - AUTO 0.0 - NONE -1. - USER-SUPPLIED	R.H.S. SENS. 1.0 - AUTO 0.0 - NONE -1. - USER-SUPPLIED

✓ ELEMENTS IN 10 COL. INTERVALS, ALL WITH DECIMAL POINTS.

✓ EACH ROW BEGINS ON A NEW CARD.

EXHIBIT 2

CARD LAYOUTS

MULTIPLE LAYOUT FORM

FOR ELECTRIC ACCOUNTING MACHINE CARDS

INTERPRETER SPACING

DATE _____

ELECTRO NUMBER ELECTRONUMBER ELECTRO NUMBER ELECTRONUMBER ELECTRO NUMBER

(7) BASIS VARIABLES — BASIS VARIABLE NUMBER FOR FIRST CONSTRAINT | 2ND CONSTRAINT | 3RD | ETC →

(8) OBJECTIVE FCN. — 1ST COEF. (NEGATED) | 2ND | ETC →

(9) 1ST CONSTRAINT — 1ST COEF. | 2ND | ETC →

4 ETC.

(10) OBJECTIVE SENSITIVITY CHANGE VECTOR — ADDITIVE CHANGE TO 1ST COEF. | ETC → | (OPTIONAL CARD - SEE PROBLEM SPECIFICATION CARD)

(11) R.H.S. SENSITIVITY CHANGE VECTOR — ADDITIVE CHANGE TO 1ST CONSTRAINT | ETC → | (OPTIONAL CARD)

(13) END OF FILE — 77 88 EOF / 77 88 EOF

(12) ("*END" CAN BE INSERTED BEFORE 77 88 EOF TO AVOID DIAGNOSTIC MESSAGE)

QM029.09

```
7JOB.S00000000.      BROWN       ....
7FET.OMDEPT.LINPG.512.00..XXXX
7OPEN.20
7QMLINPG
QMLINPG - DOCUMENT PROBLEM NUMBER ONE
2.0         4.0                                 1.0         1.0
3.0         4.0
-5.0        -3.0
4.0         4.0         1.0                     16.0
6.0         2.0                     1.0         12.0
*END
77
88EOF
77
88EOF
```

QM029.10

QMLINPG - DOCUMENT PROBLEM NUMBER ONE

TABLEAU ENTERED...

ROW	COLUMN= 1	2	3	4	5
1= 0	-5.00	-3.00	0	0	0
2= 3	4.00	4.00	1.00	0	16.00
3= 4	6.00	2.00	0	1.00	12.00

QM029.11

QMLINPG - DOCUMENT PROBLEM NUMBER ONE

ITER	FUNCTIONAL	VAR IN	VAR OUT
1	10.000000	1	4
2	14.000000	2	3

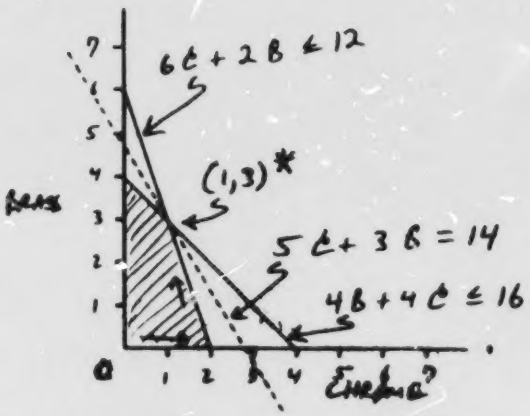
EXHIBIT 2

QMLINPG - DOCUMENT PROBLEM NUMBER ONE

FINAL SOLUTION...

VAR	VALUE
2	3.000000
1	1.000000

VAR	SHADOW COST
3	.500000
4	.500000



QM029.12

QMLINPG - DOCUMENT PROBLEM NUMBER ONE

FINAL TABLEAU...

ROW	COLUMN= 1	2	3	4	5
1= 0	0	0	.50	.50	14.00
2= 2	0	1.00	.38	-0.25	3.00
3= 1	1.00	0	-0.13	.25	1.00

QMLINPG - DOCUMENT PROBLEM NUMBER ONE

SENSITIVITY - OBJECTIVE FUNCTION...

VECTOR VAR-	1	2	3	4
CHANGE 1	1.00	0	0	0
LIMITS-	4.00	0	0	0
CHANGE 2	-1.00	0	0	0
LIMITS-	-2.00	0	0	0

2

QM029.13

QMLINPG - DOCUMENT PROBLEM NUMBER ONE

SENSITIVITY - RIGHT HAND SIDE...

VECTOR VAR-	1	2
CHANGE 1	1.00	0
LIMITS-	8.00	0
CHANGE 2	-1.00	0
LIMITS-	-8.00	0
CHANGE 3		1.00
LIMITS-		12.00

```
$JOB,S0000000,      ,RO··      ····
$FET,O=DEFT,LI=PG,512,··0,,YYXX
$OPEN,20
$QMLINPG
QMLINPG - DOCUMENT PROBLEM NUMBER TWO
3.0         4.0
3.0         4.0         5.0
-5.0        -3.0                    100.0       100.0
4.0         4.0         1.0                                         16.0
6.0         2.0                     1.0                             12.0
1.0                                             1.0         -1.0    2.0
*END
77
88EOF
77
88EOF
```

QM029.14

QMLINPG - DOCUMENT PROBLEM NUMBER TWO

TABLEAU ENTERED...

ROW	COLUMN- 1	2	3	4	5	6	7
1- 0	-5.00	-3.00	0	100.00	100.00	0	0
2- 3	4.00	4.00	1.00	0	0	0	16.00
3- 4	6.00	2.00	0	1.00	0	0	12.00
4- 5	1.00	0	0	0	1.00	-1.00	2.00

QMLINPG - DOCUMENT PROBLEM NUMBER TWO

INITIAL TABLEAU...

ROW	COLUMN- 1	2	3	4	5	6	7
1- 0	-705.00	-203.00	0	0	0	100.00	-1400.00
2- 3	4.00	4.00	1.00	0	0	0	16.00
3- 4	6.00	2.00	0	1.00	0	0	12.00
4- 5	1.00	0	0	0	1.00	-1.00	2.00

QM029.15

QMLINPG - DOCUMENT PROBLEM NUMBER TWO

ITER	FUNCTIONAL	VAR IN	VAR OUT
1	10.000000	1	5*
2	10.002420	6	4
3	10.002436	2	6

QMLINPG - DOCUMENT PROBLEM NUMBER TWO

FINAL SOLUTION...

VAR	VALUE
3	7.999952
2	.000012
1	2.000000

VAR	SHADOW COST
4	101.500000
5	96.000000
6	4.000000

QMLINPG - DOCUMENT PROBLEM NUMBER TWO

QM029.16

FINAL TABLEAU...

ROW	COLUMN- 1	2	3	4	5	6	7
1- 0	0	0	0	101.50	96.00	4.00	10.00
2- 3	0	0	1.00	-2.00	8.00	-8.00	8.00
3- 2	0	1.00	0	.50	-3.00	3.00	.00
4- 1	1.00	0	0	0	1.00	-1.00	2.00

I FTN 060 (STOP)

PREFACE

This is the Simulation Models Volume of the catalog. It contains the Simulation Models that are used in all diciplines within the Schools of Business as instructional aids. Each Simulation Model is cross referenced as to where it is located elsewhere in the catalog.

SIMULATION MODELS

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DOCUMENTATION	
PROFORMA	SM015.00
MANAGEMENT GAME	SM016.00
PRODUCTION MANPOWER GAME	SM017.00
63 GAME	SM018.00

FINANSIM:

Program Description

Each **FINANSIM** firm produces and sells an unnamed, unidentified product. For each period of play, which represents one year, Finansim managers make a number of decisions: to determine the number of production units to be manufactured; to purchase or sell marketable securities; to float new or retire existing 10-year debentures; to obtain bank-term loans to help finance company operations; to issue new common stock; to make dividend payments on existing common stock; to maintain or expand the firm's plant and machine capacity; and to invest in any or all of these different types of capital improvements; each period will effect future savings for the firm by reducing its operating costs.

Program Objectives

The advanced study of Finance through business simulation.

Documentation is located in "Computer Models in Operations Management a Computer-Augmented System," by Roz D. Harris and Michael J. Maggard. Harper and Row, 1972.

FINANISM is used in the **Finance** section under Business Finance on Page F001.00.

PROFORMA:

Program Description;

A program which will project proforma statements and ratio analysis of a firm. Up to five periods may be forecasted.

Program Objective;

To aid the student in analyzing the financial position of a firm and to help him give recommendations on how to help the firm.

SM015.00

Documentation information can be obtained from Mr. Marrah at California State University, Sacramento.

PROFORMA is used in the Finance section under Business Finance on Page F001.00.

NEVADA MANAGEMENT GAME

Program Description

This game is a business policy game designed as a general management simulation problem to provide a complex decision-making exercise. As a management game it requires participants to make decisions in each of the functional areas of marketing, production, and finance and to integrate those decisions so that the best interests of their hypothetical business firm will be served in regard to its overall goals and aspirations. Playing the game requires a business administration student to review information and techniques that have been learned in other courses, or in practical on-the-job experience, and to put into practice many of the principles of management decision-making and forward planning.

Program Objective

To provide opportunities to make business decisions of an overall management nature.

Documentation is located in The Business Policy Game, by Richard V. Cotter, ACC Educational Division, Meredith Corporation, 1973.

Nevada Management Game is used in the **Management** section under Seminar in Policy Foundation and Economic Analysis on Page Mgmt016.00.

MANAGEMENT GAME

Program Description

A game which was developed to present an environment in which students can become involved in the process of trying to resolve a dynamic, business-like problem over an extended period of time. The problem includes uncertain events, elements of risk, and a complex payoff function.

Program Objective

To provide opportunities to make business decisions of an overall management nature.

SM016.00

Documentation can be obtained from Mr. Hightower at California State University, Fullerton.

Management Game is used in the Management section under Seminar in Policy Foundation and Economic Analysis on Page Mgmt016.00.

PRODUCTION MANPOWER GAME

Program Description

The purpose of this game is to demonstrate how the use of a computer can aid in arriving at complex decisions quickly and consistently. The game is played by teams of executives, using decision rules of their own choice, and the computer, using a programmed decision rule developed from experience with this type of operation.

Program Objective

To allow the user's the use of the computer as a decision making tool, so when they go out in the field they will not be afraid to use the computer as a tool in decision making.

SM017.00

Documentation information can be obtained from Mr. Gotcher at California State University, Hayward.

Production Manpower Game is used in the Management section under Introduction to Production Operations on Page Mgmt015.00.

63 GAME (also known as HOVERLAND)

Program Description

This management game permits five teams or companies to compete in an economic market. Each team has control over a number of decision variables which will determine its success or failure in competing with each other. The basic time period involved for a given set of decisions is the quarter (i.e., three months). The results from one quarter enable each team to make further decisions for the next period. Every fourth quarter, annual statements are produced for each team.

Program Objective

To allow the participants to make managerial decisions in a simulated production and marketing environment.

SM019.00

Documentation information can be obtained from Mr. Hoverland at California State College, San Bernardino.

63 Game is used in the Management section under Managerial Accounting on Page Mgmt011.00.

PROSIM

Program Description

Each firm manufactures and sells three different unidentified products. For each period of play which represents one day, managers make a number of decisions: expenditures for quality control and for plant maintenance, the placing of regular and/or expedite raw material orders, the assignment of either of three products to each of four machines on each of two production lines, the hiring and training of workers, the assignment of workers to machines, and the number of hours of work to be scheduled for each employee.

Program Objective

The simulation of operations function of an organization so the student can experience the trials and tribulations of operations management.

Documentation is located in A Production Management Simulation by Paul S. Greenlaw and Michael P. Hohentein, International Textbook Co., Scranton, Pennsylvania, 1969.

PROSIM is used in the Management section under Basic Management Block on page Mgmt004.00, Production Management on Page Mgmt006.00.

MANSIM

Program Description

To teach participants about decision making and strategy by giving them the opportunity to run their own business and to keep the game simple, and yet dynamic as possible, so that prime emphasis can be given to decision making and not the memorization of mechanical rules.

Program Objective

To involve the student with administrative processes: planning (a financial, marketing, and production strategy), organizing (assigning duties to team members), directing and controling (reaching to competition and/or the environment).

Documentation can be obtained by writing D. H. Mark Publishing Company, Braintree, Massachusetts, 1970.

MANSIM is used in the **Management** section under Business Policies and Administration on Page Mgmt001.00

THE EXECUTIVE GAME:

Program Description

Simulates a small industry (oligopoly) in which there are few companies manufacturing and selling a single product It provides an imaginary business environment in which participants can practice the art and science of forward planning and decision making at the top management level.

Program Objective

To require the participants to deal simultaneously with all of the factors in the situation--production, marketing, finance, competition, inflation, in a realistic environment.

Documentation can be obtained by writing Richard D. Irwin, Inc., Homewood, Illinois, 1966.

The Executive Game is used in the Management section under Business Policies and Administration on Page Mgmt001.00.

INTOP

Program Description

The International Business Operations game represents the first application of a sophisticated game design to management problems in overseas operations and in coping with overseas based competitors in domestic markets. The model around which the simulation is built also permits adaptation to purely domestic business situations without any loss in depth.

Program Objective

To provide the student an interactive environment of specialized fields to develop decision-making abilities.

Documentation is located in International Operations Simulation Player's Manual (the Free Press of Glencoe 1963).

INTOP is used in the Marketing section under Business Decision Making in a Simulated Environment on Page Mkt007.00.

MARKETING IN ACTION:

Program Description

A game that was developed for use with students who have some general knowledge of the concepts and terminology of modern marketing. It is designed for use near the end of an introductory course in marketing.

Program Objective

The simulation of a competitive market situation.

Documentation can be obtained by writing Richard D. Irwin, Inc. Homewood, Illinois. 1973 3rd Edition.

Marketing in Action is used in the **Marketing** section under Marketing Principles on Page Mkt001.00, and Marketing Research on Page Mkt005.00.

BOONEFTN (Marketing Strategy):

Program Description

To expose students to the dynamics of marketing. Participants must establish company objectives and then develop strategies designed to reach their goals. They must select and analyze a group of potential consumers who constitute their market target and must develop a blend of the marketing variables which serve as their competitive weapons in appealing to this market.

Program Objective

Makes the student aware of how the computer relates to business decision making.

Documentation can be obtained by writing Charles E. Merrill, Publishing Co., Colombus, Ohio.

BOONEFTN is used in the **Marketing** section under Marketing Principles on Page Mkt001.00, Principles of Retailing on Page Mkt004.00, Marketing Management Seminar on Page Mkt008.00, **and in the Management section under Basic Management Block on Page Mgmt004.00.**

THE MANAGEMENT GAME

Program Description

A top management simulation game covering all aspects of th
business environment. In addition to student reports, a
faculty report is generated which summarizes the results of
the decisions for the present and preceding seven decisions

Program Objective

Simulates a realistic business environment which allows the
students to assume roles and make decisions in a manner
which otherwise could be done only in an actual business.
This game provided the framework around which all other
class work is structured.

Documentation can be obtained writing the MacMillan Co., New Yor
and asking for THE MANAGEMENT GAME by McFarlan, McKenney, Sieile

The Management Game is used in the **Quantitative Methods section** under Managerial Decision Analysis on Page QM010.00.

DOCUMENTATION

PROFORMA

Data Card Formats

Card	Column	Variables
1	1-24	None
2	1	Number of periods to be forecasted (1-5)
3	1-10	Sales of list period
	11-20	Net fixed assets of list period
	21-30	Preferred Stock, common stock, and paid in surplus of list period added together.
	31-40	Retained Earnings of last period.
4	1-10	Tax Rate
	11-20	Expected Annual dividends in $
	21-30	Minimum cash balance
	31-40	Accounts receivable to sales
	41-50	Inventory to sales
	51-60	Expected annual other non-current assets
	61-70	Accounts payable as a percent of sales
5	1-10	Percent of sales increase for our previous period - 1st
	11-20	Percent of sales increase for next period - 2nd
	21-30	Percent of sales increase for next period - 3rd
	31-40	Percent of sales increase for next period - 4th
	41-50	Percent of sales increase for next period - 5th
6	1-50	Same as card 5 but contains percent that cost of goods sold is of sales
7	1-50	Same as card 5 but contains percent that selling and administrative expense is of sales
8	1-50	Same as card 5 but contains expected capital expenditures
9	1-50	Same as card 5 but contains expected depreciation.
10	1-50	Same as card 5 but contains interest income
11	1-50	Same as card 5 but contains the amount of term debt outstanding
12	1-50	Same as card 5 but contains the amount of long-term debt percent in the capital structure.
13	1- 4	"ENDR"

The program operates by calculating the funds requirements with a minimum cash balance. These needs are matched against the known funds source and the difference computed. If the difference indicates a funds surplus, this amount is added to the cash account. If a deficit exists, it is automatically met with bank loans.

VERSION 1.0

CSUF VERSION OF THE MANAGEMENT GAME
INFORMATION FOR USERS

Program HBS is a modified version of the Harvard Management Game. CSUF changes to date have primarily aimed at simplifying physical handling of the game. Major changes are described in Attachment 5.

Disk Files

Program HBS uses three permanent disk files:

1. COMMON-AREA (ITP4). Contains the current values of almost all COMMON variables (from JNNUMH through ZWIP) for the last eight periods. Requires 480 blocks (60 tracks) for each industry; each period within that industry occupies 60 blocks. I/O on this unit is binary.

2. FACULTY-REPORT (File 12). Contains summarized results for the last eight periods for use in Program FACULTY. Requires 10 tracks per industry plus one block for file control information. Binary I/O.

3. PARAMETER-DECK (ITP5). Contains industry constants; requires two tracks. Standard I/O.

In addition, a temporary print file (ITP2) is used; 50 tracks are sufficient.

Program Execution

HBS reads the first two program control cards containing information which normally will remain constant throughout all periods of play:

1. Logical unit identification card (I/O Assignment Card)

2. Quarter code and number of industries card. A change in the quarter code changes the random number sequence. The number of industries is used to control the number of times Program FACULTY is executed.

If the next card is an 02 card, the initial histories are read onto ITP4 (COMMON-AREA disk file) as Period 0. The 09 card signifies the end of initial histories.

The next card is the Run card (05) and it defines the period(s) to be run. It is followed by the first industry card (13) and its decisions for all periods, then the second industry card and decisions, etc. The industry cards show the number of copies of output to be printed for each firm. Decision cards are sequenced by firm within each period. The industry structures (number of industries and number of firms within each) must be the same for each period as they were in the initial history run.

The Run card causes the initialization of the parameters and COMMON variables, then the program is executed one period at a time with the results written onto the COMMON-AREA file. Attachment 1 briefly outlines the execution of one period, and Attachments 2-4 show control card formats.

Output for each period consists of six pages per firm on 40-line paper.

Faculty Report

Program FACULTY prints a summary of game results, one industry at a time, consisting of two pages per firm plus consolidated figures for the industry. It always prints the last eight periods of game results (fewer, if prior to Period 4). It is normally run immediately after the game, but may be run at any time.

Program Limits

Number of industries: Only limit is available disk space.

Number of firms: Maximum of five firms per industry due to program size.

Number of Periods: Maximum of 20 (Periods-3 through 16).

Program Size: Requires approximately 21400 words.

Approximate Run Times for One Five-Firm Industry:

Read binary deck - 1 min.
Read initial histories - 1 min.
Execute 1 period without printing - 10 sec.
Print 1 period - 3 min.
Faculty report - 2 min.

Contents of Tape (800 b.p.i., BCD, unblocked 80, 7 TRACK)

Listing of Program HBS with four overlays

Listing of Program Faculty

Listing of parameter file creation program

Initial history for one five-firm industry (77 cards per firm)

Initial decisions for same five-firm industry (10 decision cards per period)

Sample decision set for Period 1

Following the listings and data decks are three sample deck set-ups for running:

1. Initial History Run - 2 industries, one with 5 firms, one with 3
2. Faculty Report
3. Regular Run, Period 1 - same industries

Note that initial histories and decisions are the same for each industry.

How to Get Started

1. Run the parameter file creation program. This is a permanent file and the program does not need to be run again unless parameters are changed or the file is lost.

2. Make binary decks of Program HBS (Main and 4 overlays) and Program Faculty.

3. Run Initial History. Insert the binary decks for Program HBS as indicated in the Initial History sample deck, along with appropriate overlay cards.

4. (optional) Insert binary deck for Program Faculty as indicated and run Faculty Report. If run at this point, will print Periods -3 through 0.

5. Run Period 1 as shown. Note that the RELEASE and ALLOCATE cards must be removed from Files 04 and 12 after the Initial History run. This same deck set-up would be used for all regular runs for the industries described. The only changes made from one period to the next are on the 05 Run card to indicate the period being run, and in the actual decisions themselves.

6. (optional) Run Faculty Report. If run here, will print Periods -3 through 1.

Non-Standard Runs

Up to eight prior periods may be run at once (or all 20 if beginning with initial history). Printing can be suppressed for any number of consecutive periods by adding control parameters to the Run card. (See Attachment 4, "Non-Standard Runs"). The print-suppress option is useful for testing or for re-creation of files which may have been lost.

Attachment 1 EXEQTE

	Subroutine
DO I = 1,NRFIRM	
Check decisions-adjust if necessary	CKDATA
Hire and fire men	
Move men	
Determine time for production increase	FACTRY
Production hours	
Production volume	
W.I.P. accounting	RUN
Update inventories	FACTRY
End of period accounting	
Set quality indices	QUAL
Set Sector sizes	SALES
Determine orders rec'd. for each firm and product	MARKET
Determine potential orders	MKTRES
Determine units sold, sales lost, market share	SALES
Compute business index	SALES
DO I = 1,NRFIRM	
Compute income statement for each product	ACCT
Allocate overhead	ACCT 1
Pay interest & sinking fund	FUNDS 1
Pay interest & principal on year loans	
Repay prin. on secured, unsecured, & distress loans, B.O.P	
Set up income statement for firm	ACCT 1
Issue 90-day unsecured loans, lines of credit, 1-year loans, bonds	FUNDS 2
Set up balance sheet and cash flow statement	ACCT 2
Issue secured loans, distress loans, B.O.P.	FUNDS 3
Issue stock	FUNDS 4
Adjust stock price	SELSTK
Initial stock price	STKMKT
Adjust stock price	STKMKT
Compute financial ratios	ACCT 2
DO I = 1,NRFIRM	
Print results	OUTPUT
Transform decimal to octal	OCT
DO I = 1,NRFIRM	
Write results on faculty tape	REPORT

...NTROL CARDS
...Y RUN

```
1  (JCL ENDING WITH //OMDI,DCB)
2  $RUN
3  0,1,9,2,3,4,5,6,7,8,0
4  (1=CHARACTER INCL, 0=EXCL  DIGIT OF YEAR,
5  C=NO. OF INDUSTRIES)
6  01                (READ INITIAL HISTORIES)
7  dd1 C1 C2 C3
8  (INITIAL HISTORIES  (dd1=2-DIGIT INDUSTRY NUMBER)
9  FOR IND dd1)        (C1=NO. OF FIRMS IN INDUSTRY dd1)
10
11 dd2 C1 C2 C3
12 (INITIAL HISTORIES
13 FOR IND dd2)
14 00                (END OF INITIAL HISTORIES)
15 01-3 K4           (RUN 4 PERIODS BEGINNING WITH PERIOD 3)
16 13dd1M1M2M3M4M5M6 (NO. OF CHOICES TO PRINT FOR FIRM1, FIRM2, IND dd1)
17 -(INITIAL DECISIONS-IND dd1-4 PER'S)
18 .
19 .
20 .
21 13dd2M1M2.....
22 (INITIAL DECISIONS-IND dd2-4 PER'S)
23
24 09                (END OF RUN)
25 01                (END OF JCB)
26 (JCL FOR FACILITY REPORT)
27
28
29
30
```

VERSION 10 CONTROL CARDS
REGULAR RUN - 1 PERIOD

Attachment 3

```
1  (JCL ENDING WITH LEVEL,10)
2  $RUN
3  GLOBOBJOPTIONS
4  $IN  (REGIONWIDTH WORD, REGION SIZE IN WORDS,
5        KIND OF INDUSTRIES)
6  $OFFICIAL  (RUN 1 PERIOD BEGINNING WITH PERIOD #1)
7  $ddmmyyddmmyynnnnn  (NO OF SCHEDULES TO PRINT FOR FIRST INDUSTRY)
8  (DECISIONS FOR IND ddd)
9
10
11
12 $ddmmyy
13 (DECISION FOR IND ddd)
14 $4  (END OF RUN)
15 $8  (END OF JOB)
16 (JCL FOR FACILITY REPORT)
17
18
19
20
21
22
23
24
25
26
27
28
29
30
```

VERSION 1.0 CONTROL CARDS
NON-STANDARD RUN

```
1  (JCL ENDING WITH LOAD, GO)
2  $RUN
3  6,1,0,2,0,0,0
```

Attachment 5

CSUF Version of HBS Management Game

ADVANTAGES OF HBS OVER ORIGINAL VERSION:

- Eliminates all 4 tapes--substitutes disk storage.
- Eliminates disk error. Binary deck can now be put on disk.
- Up to 7 prior periods can be run without starting from beginning.
- Printer can be suppressed for any number of consecutive periods. (One period, one industry runs in approx. 7 seconds if not printed.)
- Faculty report does not have to be run every time.
- Main program is approximately 1300 words shorter.

MAJOR DIFFERENCES:

1. As in the original version, subroutine BINTP reads and writes the entire COMMON area from INNUMH through ZWIP each time it is called. However, unlike the original, HBS writes this COMMON block once each period instead of four times per run. This allows reruns of prior periods without starting all over.

2. The new subroutine FIND uses the LOCATE function to store 8 periods per industry. 60 blocks are allotted to each period for the COMMON area. Thus Blocks 1-60 contain Period 1, Industry 1; 61-120, Period 2, Industry 1, ..., 481-540, Period 1, Industry 2, etc. In addition, 10 blocks per period per industry are used for the Faculty Report data (File 12). FIND could easily be modified to store all periods if desired.

3. Unlike the original, cumulative profits are tallied in the main program and passed to the Faculty Report. This eliminates the need for a large segment in Part 3 of Faculty which determined where to start and stop accumulating this total. Combined with the fact that File 12 stores 8 periods at a time, the need for the Faculty Report to read and write its own tape is eliminated.

4. Function AMIN1 was removed. This changed game results somewhat from Period -2 on, since the AMIN1 in the original version only has 2 formal arguments but is called with 3 arguments in subroutine RUN. HBS uses CDC's AMIN1 which is written for 2 or more arguments. Removal of this function also resulted in elimination of the "A SYS 044 OR(C2EOU10)" error which had previously stopped the run once each period. (If the 2-argument function is inserted into HBS, the results, including the error message, are identical to the old version.)

SM016.08

5. Function DISERR was changed so that RANNO generates a sequence of random numbers instead of a constant. RESETU (which provides a seed value for the random number generator) is not initialized as a function of the period number and current semester (in subroutine SALES) to produce a different, yet reproducible, sequence each semester.

6. The parameters ECA, ECB, ECC were redimensioned from 100 to 32 each. The maximum number of values required for these is the total number of periods to be run plus 12; thus, 32 is sufficient to run Periods -3 through 16.

7. The following variables have been added to COMMON (but are not read and written in BINTP):

   IQTR--code number for current semester or quarter (e.g., 13 = 1st quarter 1973). Used to change random number sequence each quarter.

   NOPR1, NOPR2--control print suppress. Default to print all periods if left blank.

   IND--industry counter. Used to locate block number in FIND and to control loop in Faculty Report.

   NIN--number of industries being run. Transmitted to Faculty Report (via File 12) in order to control loop.

   ISW1--through ISW10--switches for options to be added in the future. Not used presently.

Judy Tauscher
June 6, 1973

```
$JOB,[illegible],BOB,[illegible]
$RAT
$RAT,BOB/15
$FET,SBAE,HBS-LOAD-FILE,256,,GAME,DECK
$OPEN,10,I
$FET,GAME,COMMON-AREA,512,00,SAVE,ALL
$OPEN,04
$FET,GAME,PARAMETERDECK,512,,FOR,EVER
$RELEASE,UNUSED
$OPEN,05,I
$FET,SBAE,HBS-PRINT-FILE,146
$RELEASE,ALL
$ALLOCATE,50
$OPEN,02
$FET,GAME,FILE-12,512,00,KEEP,OUT
$OPEN,12
$LOAD,10
$RUN
```

GAME
FAC RPT ONLY

```
$JOB,05555279,BECO,[illegible],999
$FET,GAME,FILE-112,512,20,KEEP,OUT
$OPEN,112
$FET,SIBBE,FAC-RPT-LOAD-FILE,9100,,FWA,DEC16
$OPEN,20,I
$LOAD,20
$RUN
77 SDN FILE
77 SNA FILE
```

Management 3620
Intro. to Production Operations

Professor Gotcher

PRODUCTION-MANPOWER GAME

The purpose of the Production-Manpower game is to demonstrate how the use of a computer can aid in arriving at complex decisions quickly and consistently. The game is played by teams of executives, using decision rules of their own choice, and the computer, using a programmed decision rule developed from experience with this type of operation. The participants pretend that they are the production executives of a paint company, who must decide each month how many thousand gallons of paint should be made to fill expected orders and also what size of work force must be maintained to meet the production.

The decisions will be based upon the forecasted orders, the current manpower, and the current inventory. Since it is expensive to lay off or hire very many men in any one month, we must look ahead at the forecasted orders and build up our work force accordingly. At the same time there is a best value for the inventory to balance holding costs and "out-of-stock" costs. And, moreover, we must strike a happy balance between idle time for the work force and overtime work. In general, inventory and overtime work will act as cushions to absorb fluctuations in orders so that the manpower can be maintained at as constant a level as possible.

Use of Decision Rules

"Decision rules supplement, rather than displace, management judgment in scheduling production and employment. As such they are of great value in helping management to:

1. Quantify and use the intangibles which are always present in the background of its thinking but which are incorporated only vaguely and sporadically in scheduling decisions.

2. Make routine the comprehensive consideration of all factors relevant to the scheduling decisions, thereby inhibiting judgments based on incomplete, obvious or easily handled criteria.

3. Fit each scheduling decision into its appropriate place in the historical series of decisions and, through the feedback mechanism incorporated in the decision rules, automatically correct for prior forecasting errors.

4. Free executives from routine decision-making activities, thereby giving them greater freedom and opportunity for dealing with extraordinary situations."

Procedure for Playing the Game

As production executives, the members of the competing teams will decide each month what the production and manpower will be. The 3150 will also compute from its programmed decision rules the optimum production and manpower and then will compute the results of all three sets of decisions in terms of costs. The competing teams and the computer operate with exactly the same data, namely, the cost tables appended to this write-up and the forecast of sales for 12 months ahead. As decisions are made for

each month, information on the forecast for the corresponding month a year in advance should be considered in making the next month's decision.

In this version of the game, play starts on January 1, with 75 men on the payroll and 280 thousand gallons of paint on inventory as of the close of business on December 31. In general manpower should be in the range of 60 to 120 and production between 200 and 1000 thousands of gallons. For each month's play, the executive team should consider the starting values, the results to date (in months after January) the 12-month forecast, and the cost tables.

There are four costs which must be considered: regular payroll, overtime costs, hiring and layoff costs, and inventory holding costs. Although overhead and material costs are present, the production department decisions are not concerned with them in an over-all sense. The cost tables list the costs as determined by an empirical study of the company.

Regular Payroll Costs. This table shows that on the average each man has a payroll cost of $340 per month. This does not include overtime.

Hiring and Layoff Costs. The cost of hiring or laying off includes such things as reorganization costs, training or separation costs, etc., and for simplicity we shall assume that, on the average, the cost is the same whether for hiring or for layoff. The costs indicate that hiring or laying off should be done gradually over a period of several months for it becomes quite expensive to hire more than three or four men in any one month.

Overtime Costs. From this table it is seen that, for example, a work force of 90 men could make up to 500,000 gallons without overtime, although if they made much less than that there would be idle times. Each man can on the average make about 5,500 gallons per month without overtime.

Inventory Costs. This table shows relative holding costs for inventory which increases as the number of gallons in inventory increases over 320,000. When inventory gets below 320,000 out-of-stock conditions begin to take place with an increase in back orders, so an estimation of the cost of tolerating back orders accounts for the increasing inventory cost at low values of inventory. Negative inventory means all back orders. The optimum level for inventory is 320,000 gallons as far as inventory costs are concerned.

OVERTIME COST

Prod. Rate (Thous. Gallons)	No. of men	60	70	80	90	100	110	120
100								
200								
300								
350		1079						
400		4335	812					
450		8591	3934	563				
500		13847	8056	3551	331			
550		20103	13178	7539	3185	118		
600		27359	19300	12527	7039	2838		
650		35615	26422	18515	11893	6558	2508	
700		44871	34544	25503	17747	11278	6094	2197
750		55127	43666	33491	24601	16998	10680	5649
800		66383	53788	42479	32455	23718	16266	10101
850		78639	64910	52467	41309	31438	22852	15553
900		91895	77032	63455	51163	40158	30438	22005
950		106151	90154	75443	62017	49878	39024	29457
1000		121407	104276	88431	73871	60598	48610	37909

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REGULAR PAYROLL COSTS

Total Work Force (No. of Men)	Regular Payroll Cost Per Month
10	$ 3400
20	6800
30	10200
40	13600
50	17000
60	20400
70	23800
80	27200
90	30600
100	34000
110	37400
120	40800

HIRING OR LAYOFF COSTS

Hired or Laid Off Per Month (No. of Men)	Hiring or Lay-off Costs
1	$ 64
2	257
3	579
4	1029
5	1608
6	2315
7	3151
8	4115
9	5208
10	6430
15	14468
20	25720

INVENTORY COSTS

Net Inventory (Actual inventory less back orders) in thous. of gals.	Net Cost Per Month
- 200	$22308
- 150	18224
- 100	14553
- 50	11294
0	8448
+ 50	6014
100	3993
150	2384
200	1188
250	404
300	33
350	74
400	528
450	1394
500	2673
550	4364
600	6468
650	8984
700	11913
750	15254
800	19008

OUTPUT COLUMN HEADINGS

FRCST	The value of forecasted orders for this month, in thousands of gallons.
ACTL	The actual orders for the month. (This 3150 version of the game has a feature whereby the uncertainties of real life are simulated by randomly selected additions to or subtractions from the forecast (Monte Carlo Technique). The new inventory balance and costs are calculated from the actual values.
PROD	This is the production as predicted by the team, in thousands of gallons.
INV	The new inventory in thousand gallons calculated by adding last month's inventory and this month's production and subtracting this month's actual orders.
MEN	This is the manpower as decided upon by the team.
PAYROLL	This is the regular payroll cost based on the number of men.
HIRING	This represents the hiring or layoff costs for the change in the manpower from last month.
OVERTIME	This is the overtime cost for the month based upon the production and manpower decisions. No cost in this column indicates either exact matching of production and manpower or else it indicates idle time, i.e. the existing manpower is not being used to capacity. The value of 5,500 gallons as the productive capacity of one man per month without overtime can be used to check the percentage of idle time.
INV	This is the inventory holding cost based on the net inventory at the end of the month.
TOTAL	This is the total monthly cost which is the sum of the four preceding columns.

FORECASTED ORDERS
(in thousand gallons)

Jan.	730
Feb.	470
Mar.	570
Apr.	560
May	460
June	590
July	580
Aug.	440
Sept.	450
Oct.	750
Nov.	450
Dec.	630
Jan.	380
Feb.	370
Mar.	528
Apr.	720
May	420
June	800
July	565
Aug.	430
Sept.	360
Oct.	750
Nov.	683
Dec.	546
Jan.	640
Feb.	495
Mar.	585
Apr.	720
May	865
June	482
July	655
Aug.	850
Sept.	621
Oct.	450
Nov.	540
Dec.	710

GENERAL DESCRIPTION

This Management Game permits five (5) teams or companies to compete in an economic market. Each team has control over a number of decision variables which will determine its success or failure in competing with each other.

The basic time period involved for a given set of decisions is the quarter (i.e., three months). The results from one quarter enable each team to make further decisions for the next period. Every fourth quarter, annual statements are produced for each team.

The Game Supervisor has control over three parameters which may be varied from quarter to quarter and from company to company. These are described below.

INPUT DESCRIPTION

The Game Supervisor must supply four (4) data cards (CTL card, Z Data card, Alpha Data card, and Alpha-Prime Data card). Each team must supply one data card (Decision Data Card).

CTL DATA CARD

Card Column	Parameter
6 - 7	Quarter - This variable is equal to the quarter which is being played. Permissible values are 0 - 99. A value of "0" indicates quarter Zero which will produce initial reports for each company.
14	Short Code - Indicates what action should be taken if a negative surplus is encountered. Acceptable values and their meanings are listed in APPENDIX - A
21	Annual Statement Control - This variable normally has a value of "0" or blank indicating annual statements are to be produced every fourth quarter (0,4, 8,12...). A value of one will force statements to be produced for this quarter based on the previous four quarters.
28	Copies, Reports - This variable specifies the number of each company's quarterly report (and annual report at the end of each year) to be printed. (Maximum is 20.

Card Column	Parameter
35	Copies, Worksheets - This variable specifies the number of copies of each team's decision worksheets to be printed. Maximum is 20.

N.B. All above data must be right-justified and punched without decimal point, etc.

Z DATA CARD

Card Column	Parameter
1 - 7	Z

This parameter indicates the general state of the economy. Possible values range between +200,000 to -200,000 in steps of 1.

A value of approximately 50,000 has proven to provide a realistic rising economy, and is, therefore, recommended.

ALPHA Data Card

The value of Alpha indicates the company's effectiveness in research and development. Five Alpha values are to be given; one for each company. Possible values range between 10 and 50 in steps of "1". The effect Alpha will have on a company is determined by the difference in its value as compared to another company's value (i.e., the ratio of the two values not their actual values).

Company	Card Column	
1	6 - 7	
2	13 - 14	
3	20 - 21	Card Locations for Company Alpha Values
4	27 - 28	
5	34 - 35	

ALPHA-PRIME DATA CARD

Alpha Prime indicates the company's effectiveness in marketing. Five values must be given, one for each company. Values may range between 10 and 50 in steps of 1. All five values are given on one card having the same format as the Alpha Data Card. The effect of Alpha-Prime is measured like that of Alpha (i.e., the ration between companies.).

DECISION DATA CARD (These cards will be punched by each team and given to the Game Supervisor)

There must be one card of this type for each company. Values for the various parameters listed are chosen by each team from the "Operating Decision Information" portion of the quarterly report.

Card Column	Variable
1 - 7	Additional Plant Investment
8 - 14	Discard of Plant
15 - 21	Market Research Cost
22 - 28	Price Multiplied by 100
29 - 35	Unit Cost multiplied by 1000
36 - 42	Number of Units
43 - 49	Cost of Production
50 - 56	Marketing
57 - 63	Research and Development
64 - 70	Dividends
71 - 77	Change in Loans, Positive or Negative
78 - 80	Company Number (1 - 5)

NOTE: ALL DATA MUST BE RIGHT JUSTIFIED AND MUST NOT CONTAIN A DECIMAL POINT.

INPUT SEQUENCE OF DATA CARDS

The program must be supplied with the following Data Cards for each quarter:

Z Data Card

Alpha Data Card

Alpha-Prime Data Card

Decision Data Card for companies one through five

These cards must be in this sequence and the decision data cards must be in ascending sequence by company number

Since the program does not store results from one quarter to another, the Game Supervisor must supply it with a CTL Card

indicating what quarter is being played. Along with the Data Cards for this quarter (see above), the Data Cards for this quarter must be preceded by a similar set of Data Cards for each previous quartter including quarter Zero.

EXAMPLE: Quarter 2

	Card Type	# of Cards	
QRTO	CTL Card	1	
	A, Alpha, Alpha Prime	3	
	QRTO Decisions	5	
QRTL	Z, Alpha, Alpha Prime	3	First Team Decision
	QRTL Decisions	5	
QRT2	Z, Alpha, Alpha Prime	3	Second Team Decision
	QRT2 Decisions	5	

JOB SET-UP AND OPERATING PROCEDURES

Five or more copies of quarter "0" reports will be run off, using the quarter "0" sample control cards, to distribute among the various teams and monitoring personnel. These reports should be identical (i.e., each of the teams should have the same Alpha, Alpha Prime and Decision Data Cards).

Each team makes its decisions for Quarter 1 and submits one data card to the Game Supervisor. A complete run for the first Quarter is then made. This should be submitted as a normal batch job as shown in Appendix B. The resulting output is distributed to the teams and monitoring personnel by the Game Supervisor.

Each team then makes decisions for Quarter 2 and punches new data cards. This process continues for as many quarters as are considered useful. At each Quarter the Game Supervisor provides a new Z card, Alpha Card, and Alpha-Prime Card.

A sample data stack for two quarters is shown in Appendix B. It is important to understand that the data for all previous quarters remain in the stack when the cards for a new quarter are added.

This variable indicates what action should be taken if a Negative Surplus is encountered.

Value	Action
1	Ignore shortage and read a new decision data card for this company.
2	Accept loans up to line of credit.
3	Accept all available loans.
4	Terminate execution upon shortage.
5	Ignore shortage and continue processing.

NOTE: A value of 3 is recommended.

Also, it should be noted that the Short Code Parameter values should not be changed from quarter to quarter as this value has a bearing on the intermediate calculations for each quarter preceding the quarter presently being run.